

How does socio-economic disadvantage influence body weight? The mediating role of psychological distress and maladaptive coping strategies.

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Word Count

(Inclusive of Tables, Figures and Appendices)

The screenshot shows the Microsoft Word interface with a document titled "for word count.docx" in Compatibility Mode. The ribbon is set to the "Review" tab. A "Word Count" dialog box is open, displaying the following statistics:

Statistics:	
Pages	81
Words	21,531
Characters (no spaces)	121,241
Characters (with spaces)	142,948
Paragraphs	1,139
Lines	3,397

The dialog box also includes a checkbox for "Include textboxes, footnotes and endnotes" which is checked, and a "Close" button.

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inform future interventions.

Keywords: Socio-economic status (SES), psychological distress, eating behaviours, systematic review.

Introduction

Obesity, eating behaviours and socio-economic status (SES)

The cost of obesity in the UK is estimated to be £16 billion and despite initiatives, obesity levels continue to rise (Public Health England, 2017). The epidemic is of ever growing concern with national statistics suggesting that population are obese, a 10% increase on eight years previous (NHS Choices). Weight management strategies focus on two primary factors; diet and sedentary behaviour (Parsons et al., 1999). However, their success, especially in regards to long-term weight loss, has been found to be limited within recent systematic review (Johansson, Neovius & Hemmingsson, 2014).

One factor that has been found to be consistently associated with obesity is socio-economic status (SES). Socio-economic disadvantage incorporates factors related to income inequality/disparities, broader economic outcome inequalities between different socio-demographic groups, the geographical distribution of inequalities and educational attainment (Cederberg, Hartman and Lingard, 2009). Working-class adults and children are more likely to be obese than their middle- or upper-class peers (National Audit Office, 2001; Wardle, Waller & Jarvis, 2002). Wardle, Broderick, Cole, Jarvis and Boniface (2006) found that the prevalence of obesity was highest among children and adolescents with significant

Currently, we know little about the underlying mechanisms which explain the relationship between socio-economic disadvantage and obesity (Stamatikis et al., 2005). Financial difficulties alone do not appear to fully explain this association. Avert and Smith correlation between financial hardship and body weight; however, they his relationship was not causal, indicating that other, unmeasured factors may be involved. One such underlying mechanism could be an increase in stress following financial hardship and subsequent maladaptive coping strategies. In other research, factors such as eating to cope, in response to this distress. In other research, factors such as low-cost food have not been found to account for the relationship between obesity and the availability of low-cost, unhealthy foods (Cobb et al., 2014). Our understanding of the nature of the relationship between low SES and obesity is currently limited. Whilst obesity itself is often highlighted as of most concern, eating behaviours which result in weight gain (such as binge eating, emotional eating, food addiction etc) are also important to consider.

In light of the above, a recent theoretical model by Hemmingsson (2014) has proposed a causal pathway between SES and obesity. The full proposed model is multifaceted and longitudinal in nature. It considers the direct impact of socio-economic disadvantage on psychological distress in adults. This distress then impacts the wider family creating a 'disharmonious family environment' and 'offspring distress' which in turn leads to further psychological distress, negative coping and maladaptive eating behaviours within the family as a whole, such as emotional eating and increased consumption of comfort foods. The model emphasises the importance of reverse causality where repercussions reinforce earlier

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iii. Introductory Chapter

Chapter One is a systematic review which aims to investigate existing research into the relationships between socio-economic status (SES), psychological distress and maladaptive eating behaviours. To date, no systematic review has been published which examines the available literature on the inter-relationships between these variables. This area was chosen for review due to a recent theoretic model by Hemmingsson (2014), which proposes a socio-emotional model of obesity encompassing these variables. Eleven papers were found to meet criteria for the review.

Chapter Two is an empirical paper which aimed to explore the role of psychological and emotional factors in the relationship between SES and BMI. Lower SES has been shown to be significantly associated with higher body weight (Parsons, Power, Logan, & Summerbelt, 1999). There is currently little understanding as to the psychological mechanisms which underpin this relationship (Stamatakis, Primatesta, Chinn, Rona, & Falascheti, 2005). The majority of available research has considered non-psychological factors such as availability of low-cost food, however, findings of such research have not been able to fully account for the relationship between SES and obesity (Cobb et al., 2015). The aim of the empirical paper was to investigate predictions based on the theoretical socio-emotional model of obesity proposed by Hemmingsson (2014). Primarily, the study considers whether socio-economic disadvantage increases psychological distress which, in turn, promotes maladaptive coping behaviours, such as emotional eating, and ultimately obesity. Furthermore, the study assesses if resilience moderates the association between socio-economic disadvantage and distress, thus providing a protective role.

The empirical paper will be submitted to the British Journal of Health Psychology for publication. This journal was chosen by the author due to its interest in publishing original research into psychological aspects of health and health-related behaviours. As a result, it was

felt that the empirical paper was appropriate for the journal in question and satisfied its remit and objectives.

iv. Chapter One

The role of psychological distress in the relationship between socio-economic status and maladaptive eating behaviours: A systematic review

Abstract

Background and objectives: Lower socio-economic status (SES) is robustly associated with obesity; however, the underpinning psychological mechanisms remain unclear. A recent theoretical model proposes a socio-emotional understanding of obesity whereby socio-economic disadvantage increases psychological distress which, in turn, promotes maladaptive coping behaviours (e.g. emotionally-driven eating) and ultimately obesity (Hemmingsson, 2014). The current systematic review aims to examine supporting evidence for this model.

Design: Systematic review **Method:** Relevant papers were located through the screening of four electronic databases. Inclusion criteria were: original research, conducted with human adult participants within a developed Western country, the inclusion of a measure for the following: SES, psychological distress and maladaptive eating behaviour, with data analysis considering the inter-relationships between these three variables. A total of 11 papers were eligible for review and were assessed for quality using the 16 item Quality Assessment Tool for Studies with Diverse Designs. **Results:** Factors related to lower SES (objective or subjective) were generally found to be related to increased maladaptive eating behaviours.

Increased psychological distress was also found to be associated with increased maladaptive eating behaviours. Six of the 11 studies reviewed support the idea that psychological distress mediates the relationship between SES factors and maladaptive eating behaviours. Only two of the 11 studies reviewed found no supporting evidence for this pathway with three providing partial support. **Conclusions:** The studies reviewed appear to offer some support for the socio-emotional model proposed, indicating that the relationship between SES and obesity may be partially explained via increased psychological distress and increased maladaptive eating behaviours. Interventions that target both socio-economic deprivation and maladaptive coping strategies to distress may be beneficial to reduce obesity in socially deprived populations. The review highlights the need for further research, explicitly testing

the pathway in its entirety using validated measures. Additional consideration of gender and possible protective factors such as individual resilience may also be beneficial, to better inform future interventions.

Keywords: Socio-economic status (SES), psychological distress, eating behaviours, systematic review.

Introduction

Obesity, eating behaviours and socio-economic status (SES)

The cost of obesity in the UK is estimated to be £16 billion and despite current initiatives, obesity levels continue to rise (Public Health England, 2017). The obesity epidemic is of ever growing concern with national statistics suggesting that 25% of the population are obese, a 10% increase on eight years previous (NHS Choices, 2013). Current weight management strategies focus on two primary factors; diet and sedentary lifestyle (Parsons et al., 1999). However, their success, especially in regards to long-term maintenance of weight loss, has been found to be limited within a recent systematic review (Johansson, Neovius & Hemmingsson, 2014).

One factor that has been found to be consistently associated with obesity is socio-economic status (SES). Socio-economic disadvantage incorporates factors related to income inequality/disparities, broader economic outcome inequalities between different socio-demographic groups, the geographical distribution of inequalities and educational attainment (Cederberg, Hartsmar and Lingarde, 2009). Working-class adults and children are more likely to be obese than their middle or upper-class peers (National Audit Office, 2001; Wardle, Waller & Jarvis, 2002). Wardle, Brodersen, Cole, Jarvis and Boniface (2006) found that the prevalence of obesity was highest among children and adolescents with significant socio-economic and ethnic inequalities. Furthermore, a systematic review by Parsons et al. (1999) found that lower childhood SES was associated with weight gain in adulthood.

Currently, we know little about the underlying mechanisms which explain the relationship between socio-economic disadvantage and obesity (Stamatakis et al., 2005). Financial difficulties alone do not appear to fully explain this association. Averett and Smith (2014) found a correlation between financial hardship and body weight; however, they concluded that this relationship was not causal, indicating that other, unmeasured factors may explain this association. One such underlying mechanism could be an increase in psychological distress following financial hardship and subsequent maladaptive coping strategies, such as eating to cope, in response to this distress. In other research, factors such as the availability of low-cost food have not been found to account for the relationship between SES and obesity. Indeed, a systematic review found little evidence for the association between obesity and the availability of low-cost, unhealthy foods (Cobb et al., 2015). Therefore our understanding of the nature of the relationship between low SES and obesity is currently limited. Whilst obesity itself is often highlighted as of most concern, eating behaviours which result in weight gain (such as binge eating, emotional eating, food addiction etc) are also important to consider.

In light of the above, a recent theoretical model by Hemmingsson (2014) has proposed a causal pathway between SES and obesity. The full proposed model is multifaceted and longitudinal in nature. It considers the direct impact of socio-economic disadvantage on psychological distress in adults. This distress then impacts the wider family creating a ‘disharmonious family environment’ and ‘offspring distress’ which in turn leads to further psychological distress, negative coping and maladaptive eating behaviours within the family as a whole, such as emotional eating and increased consumption of comfort foods. The model emphasises the importance of reverse causality where repercussions reinforce earlier stages; for example, the social, psychological, emotional and behavioural consequences of obesity can lead to further psychological distress and maladaptive eating behaviours in a

negative cycle. Similarly to Hemmingsson's model, systemic factors and family dynamics have long been highlighted in the literature as integral to the development and maintenance of eating disorders, namely anorexia, such as within Minuchin's Structural Family Therapy Model (Minuchin, Rosman & Baker, 1978). Hemmingsson's model however, also allows for steps in the process to be skipped for example 'disharmonious family environments' and 'offspring distress' in regard to adult onset obesity. The model also proposes a calibration mechanism whereby positive factors such as high resilience and high self-worth act as protective factors, thereby reducing the risk of obesity.

A key prediction of this model is that socio-economic disadvantage is causally related to obesity via increased levels of emotional distress. Emotional distress is believed to lead to maladaptive coping strategies, such as eating to suppress negative emotions, resulting in higher body weight (See Figure 1, an adapted model based on the socio-emotional model of obesity Hemmingsson, 2014). The adapted model of obesity, as depicted in Figure 1, has yet to be formally tested in its entirety and a systematic review of available empirical papers which have considered the interplay of the factors in Figure 1 has not yet been undertaken.

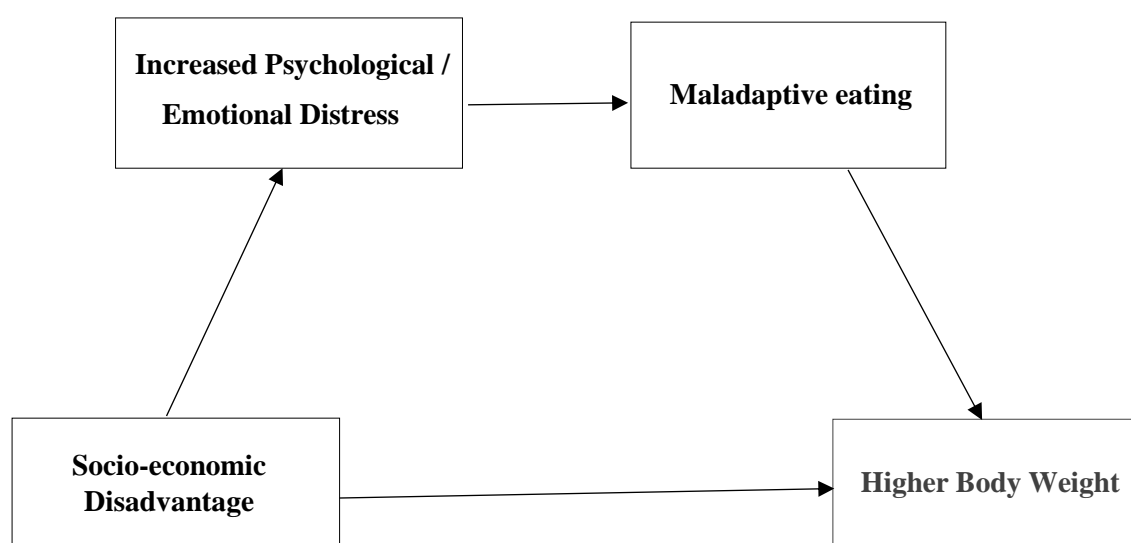


Figure 1. Adapted model based on Hemmingsson's socio-emotional model of obesity (2014)

For the purposes of this review, maladaptive eating refers to those behaviours which encompass over-consumption of food such as emotional eating, food addiction, and binge eating rather than the restriction of food. Emotional eating has been found to be a significant predictor of obesity/higher BMI (Geliebter & Aversa 2003). A longitudinal study by Laitinen, Ek, and Sovio (2002) found that emotional factors and stress-driven eating at aged 14 years were predictors of higher BMI at age 31 years. Reviews of the link between emotional eating and obesity, in various forms, have been conducted as far back as 1989 (Ganley, 1989). As with obesity, higher levels of socio-economic disadvantage have been found to be associated with the utilisation of maladaptive eating behaviours (Brunner, Chandola, & Marmot, 2007).

Research indicates a link between socio-economic disadvantage (i.e., income inequality and lower social status) and psychological distress, such as higher rates of depression and lower mental wellbeing (Lorant et al., 2007; Pickett & Wilkinson, 2015). Within a longitudinal study, Lorant et al. (2007) found that negative changes in material living standards and significant negative life events increased depression. To a lesser effect, but still present, positive changes resulted in decreased levels of depression.

Studies have indicated that depression and anxiety increase the risk of becoming overweight (McElroy et al., 2004; Rofey et al., 2009). This may be due to individuals using food as a self-therapeutic intervention, which is supported by a recent qualitative study (Von Essen & Martensson, 2014). Other research has highlighted changes in food consumption dependent upon induced negative emotion, with normal and overweight individuals consuming more under conditions of negatively induced emotional states (Geliebter & Aversa, 2003).

Whilst some studies appear to show support for components of the socio-emotional model of obesity, the full pathway from SES to psychological distress to maladaptive eating behaviours has not been explicitly considered. It is now important to do so because by

increasing our understanding of the key drivers of maladaptive eating behaviours, we may be better placed to establish which interventions will be most helpful and for whom.

Aims of the review

Given the impact of obesity both in regards to individual and societal health, identifying risk factors is important to shape future interventions. This is especially significant in the current climate of growing economic challenges for the National Health Service (NHS), the current difficulties in successfully treating severe obesity and the expense of treating associated health conditions.

The review aims to identify and describe all published papers which assess SES, psychological distress and maladaptive eating behaviours in relation to one another. The review will aim to establish the existing empirical evidence which maps onto the adapted model as depicted in Figure 1, based on Hemmingsson's socio-emotional model of obesity (2014). There is currently very little literature on the psychological mechanisms underpinning the relationship between SES and higher body weight, even less which has considered SES and psychological distress in conjunction with both maladaptive eating and BMI. The model highlights maladaptive eating behaviours such as emotional eating as a key component in the causal pathway to higher body weight. There is substantial existing support for the relationship between maladaptive over-eating behaviours (e.g. emotional eating) and BMI (Geliebter & Aversa 2003). Therefore, the review will focus on available literature concerning the first three variables depicted in Figure 1 (i.e., SES, psychological distress and maladaptive eating behaviours) rather than focusing on weight and BMI.

Method

A systematic review protocol was generated with consideration of PRISMA principles (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). The protocol was registered on

PROSPERO, an international database of systemic reviews for health-related fields. The aim of the database is to prevent duplication of reviews and reduce reporting bias via comparison with the original protocol submitted (PROSPERO, 2017).

Study identification

A comprehensive literature search was undertaken, consisting of the screening of four electronic databases. Articles published at any time up until the date of review (March 2017) and indexed in the following databases were searched: MEDLINE (from the year 1948), PsychINFO (from the year 1887), PubMed (from the year 1950) and Scopus (from the year 1823). The search was conducted using the search terms outlined in Table 1. MESH terms for keywords, within each of the proposed databases, were also obtained and used within the search.

Table 1

Terms Used for Search Strategy Within Electronic Databases

Variable	Alternative search terms used
Socio-economic status AND	"socioeconomic status" OR "socio-economic status" OR "socio economic status" OR "socioeconomic disadvantage" OR "socio-economic disadvantage" OR "socio economic disadvantage" OR "deprivation" OR "social status" OR "social class*" OR "poverty"
Psychological distress AND	"psychological distress" OR "psychological well*" OR "psychological factor*" OR "emotional distress" OR "emotional well*" OR "stress" OR "anxi*" OR "depression".
Maladaptive eating behaviours	"maladaptive eating" OR "emotional eating" OR "eating to cope" OR "comfort eating" OR "eating to sooth" OR "uncontrollable eating" OR "disinhibition" OR "binge eating" OR "eating behav*"

Note. Truncation * and the boolean operator OR were used to widen the search terms. The boolean operator AND was used to link the searches for each variable to focus the search as all three variables were required to be present to meet criteria for review.

Eligibility criteria

The review considered both qualitative and quantitative methodology. The inclusion criteria were as follows: 1. Must be conducted with human adult participants 2. Must be conducted within countries assessed as Western developed nations in line with Hemmingsson's (2014) model boundary highlighting North America and Europe explicitly 3. Explicitly considers all three of the following variables: SES, psychological distress and maladaptive eating behaviour 4. Consideration of the inter-relationships between these three variables 5. Must be original research.

In regards to criteria three, studies were required to have measured a construct of SES that maps onto the definitions previously provided by Cederberg, Hartsmar and Lingarde (2009). In regards to psychological distress, any measure which considered an internal construct of emotional difficulty was deemed appropriate whether that be focused upon symptoms of depression, anxiety or symptoms of another psychological disorder. As for maladaptive eating measures, behaviours associated with the over consumption of food (such as binge eating, emotional eating, food addiction etc) were required, rather than the restriction of food, as the review aimed to examine the pathways to obesity, rather than consequences of maladaptive under-eating behaviours.

Titles and abstracts from the initial search were reviewed against inclusion and exclusion criteria. The full text of potentially eligible articles was then reviewed against eligibility criteria. A second reviewer was utilised to screen a randomly selected 10% of the papers at initial screening and full-text review to ensure consistency of criteria application. The second reviewer also checked all of the final papers for review against inclusion and exclusion criteria.

Data abstraction and synthesis

Data abstracted from studies found for review is outlined in Table 2. The characteristics considered include socio-demographic information on the sample, methodological design, measurement tools used, key outcomes and quality rating generated for each study. Due to the diversity of the papers eligible for review in both methodological design and heterogeneity of samples, a meta-analysis was deemed inappropriate.

Assessment of study quality

Study quality was assessed using the 16 item Quality Assessment Tool for Studies with Diverse Designs (QATSDD (Sirriyeh, Lawton, Gardner & Armitage, 2012)). The QATSDD has been shown to possess good validity and inter-rater reliability ($K = 72\%$) when used in the assessment of studies with diverse designs (Sirriyeh et al., 2012). The tool provides 12 items which relate to both quantitative and qualitative studies. The remaining four items consist of two items which refer solely to qualitative methodology and two items which refer to only quantitative methodology. Each item is scored on a scale of zero to three with higher scores reflecting a higher degree of quality related to that item. Guidance on how to score each item is provided for the author by the tool however, it is acknowledged that some degree of judgement is required (see Appendix A). Each study was quality assessed independently by two reviewers with scores then cross-checked to ensure consistency. Any discrepancies in scoring were discussed with reference to original guidance by the tool and then consensus reached over the most appropriate score to use. Overall quality ratings are calculated and presented as percentages with higher percentages indicative of a greater degree of quality. A summary of the quality assessment completed is illustrated in Table 3.

Results

The initial search of electronic databases identified a total of 830 citations. Of these, 71 articles appeared to meet criteria for further exploration and their full texts were assessed against our eligibility criteria. Eleven articles meet the inclusion criteria for review and are listed in Table 2 (Berenson, Laz, Pohlmeier, Rahman, & Cunningham, 2015; Bratanova, Loughnan, Klein, Claassen, & Wood, 2016; Breland, McAndrew, Gross, Leventhal, & Horowitz, 2013; Kaplan, Madden, Mijanovich, & Purcaro, 2013; Laitinen et al., 2002; Michopoulos et al., 2015; Reagan & Hersch, 2005; Richardson, Arsenault, Cates, & Muth, 2015; Schmidt, 2012; Sims et al., 2014; Troop, 2016). A comprehensive depiction of the selection process can be found in Figure 2.

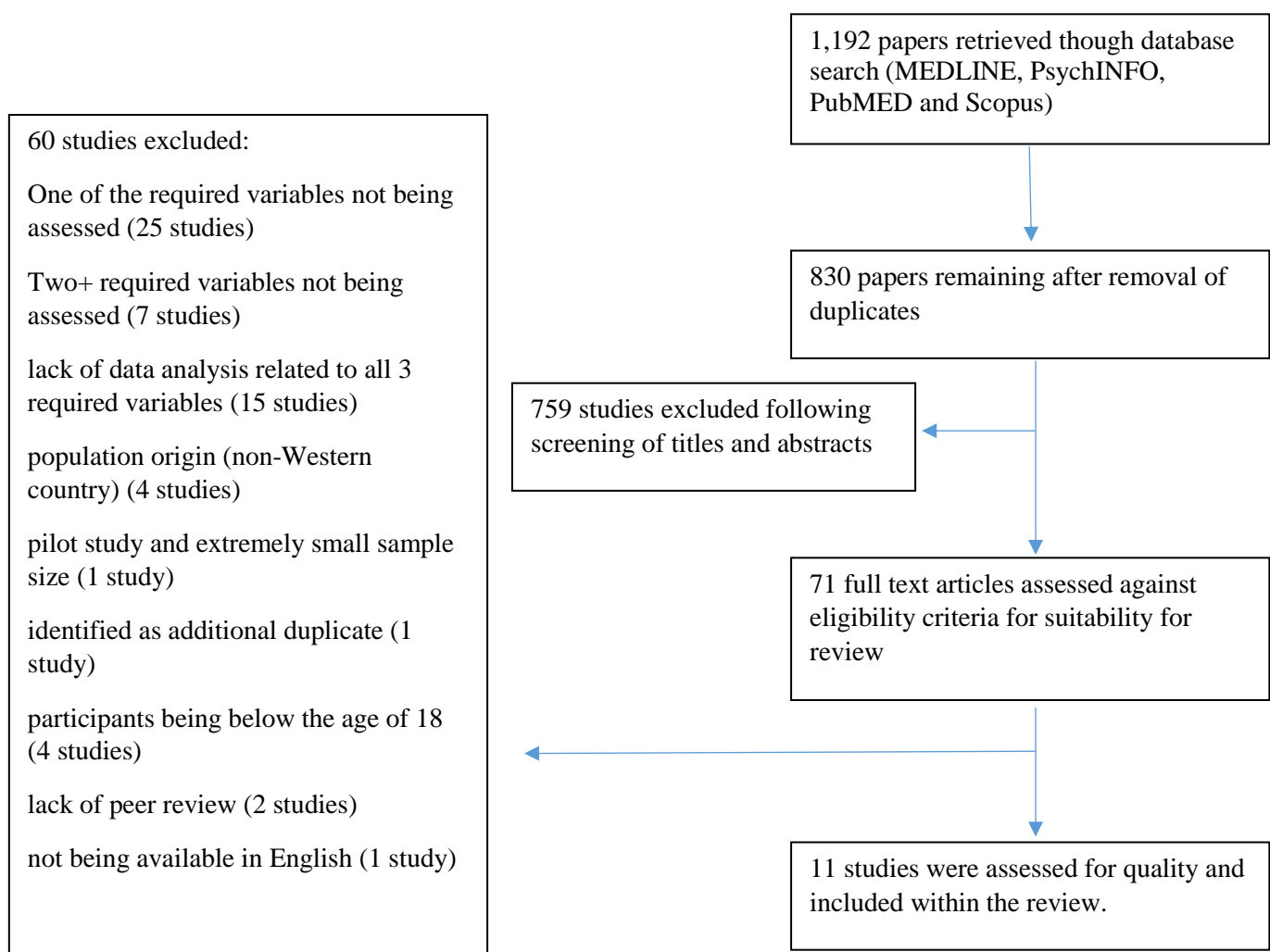


Figure 2. Flow diagram of article selection process.

Table 2

A Summary of the Design and Outcomes for Each 11 Studies Reviewed.

First author, country, year of publication	Primary focus of article	Sample characteristics (N)	Age	Methodology	Design	Data collection method	Measurement tools	Reported outcome	Quality (%)
Berensen et al., USA (Texas) 2015	Food addiction, low income in reproductive aged women	N = 1067, women, non-pregnant, attending reproductive health clinic. White (27%), Black (41.6%) and Hispanic (31.4%).	16 - 40 y, M = 26.9 (SD = 5.8)	Quantitative	Cross-sectional	Questionnaires	Demographics: age, ethnicity. SES factors: education, income. BMI from medical records Beck Depression Inventory – Fast Screen (BDI-FS) 25 item Yale Food Addiction Scale (YFAS)	No significant association between food addiction and the following demographic variables: age, ethnicity, income and education. <i>Depression significant (+) association with food addiction**.</i> <i>Symptom count on the YFAS significant associated with Race/Ethnicity** and (+) BMI**</i>	66.6
Bratanova et al., UK, 2016	Poverty, health inequality and increased maladaptive eating behaviour	N = 54, undergraduate students (28 female, 26 male).	Age range data not provided, M = 20.54 y (SD = 4.79)	Quantitative	Experimental	Questionnaires, Free reporting in writing Measured calorie consumption	Self-report: family SES on a 7 point scale (1 = Lower/Working; 7 = Upper/Wealthy), level of hunger on 7 point scale. Demographics: age, gender, nationality. Inequality induced anxiety measure. Calorie intake measure.	<i>Experimentally manipulated socio-economic position significantly associated with increased calorie consumption via increased anxiety ***</i> <i>Experimentally manipulated poverty significantly associated with calorie consumption*</i> <i>Gender significantly associated with calorie consumption*</i>	61.9

First author, country, year of publication	Primary focus of article	Sample characteristics (N)	Age	Methodology	Design	Data collection method	Measurement tools	Reported outcome	Quality (%)
Breland et al., USA (East Harlem, New York) 2013	Challenges to healthy eating for people with diabetes from a low-income neighbourhood.	N = 37, adults with a diagnosis of diabetes (gender data not provided). (Average 8 years since diagnosis and 68% foreign born (Latin America))	27 – 80 y, M = 54.97 (SD =14.15)	Qualitative		Focus group	Semi-structured interview	<i>Stress in large part due to poverty and discrimination was seen as a causal factor for unhelpful eating behaviours.</i>	61.9
Kaplan et al., USA (South Bronx, New York), 2013	Perceptions of stress and its impact on health in poor communities	N = 56 (32 men, 24 women) 30% black, 55% Hispanic/Latino, 11% biracial, 2% non-Hispanic white, 2% did not identify race.	18 – 70 y, M = 35 (SD data not provided)	Qualitative		7 Focus groups	Semi-structured interview	<i>The theme of stress directly due to low SES and the use of uncontrolled eating/erratic eating/overeating as tools to self-soothe or self-medicate.</i> <i>The theme of lower SES resulting in limited resources to combat stressful events, increasing vulnerability to impact.</i>	66.6
Laitinen et al., Finland, 2002	Factors which predict stress-related eating and drinking behaviour.	N = 5150 (2359 men and 2791 women)	31 y (all participants)	Quantitative	Birth cohort longitudinal	Questionnaires and physical examination	Demographic info: gender age. SES: father's occupation and prestige, education, employment status. Ways of Coping Checklist (WCCL), BMI, Questions re food and alcohol consumption, (reliability shown to be high)	<i>Stress-driven eating significantly (+) associated with obesity in women **, No significant association found for men.</i> <i>For men, the following factors associated with stress-related eating: a long history of unemployment (+)***, academic degree (+)*, occupational education (-). For women the following factors associated with stress-related eating: emotional support (-)*, long history of unemployment (+)**.</i> Family's social class at birth was non-significant for both genders.	71.4

First author, country, year of publication	Primary focus of article	Sample characteristics (N)	Age	Methodology	Design	Data collection method	Measurement tools	Reported outcome	Quality (%)
Michopoulos et al., USA (Atlanta, Georgia) 2015	The mediating role of emotion dysregulation and depression in the relationship between childhood trauma exposure and emotional eating.	N = 1110 (892 female, 218 male). 93% African American/Black.	18 – 65 y, M = 39.6 (SD data not provided)	Quantitative	Cross-sectional	Questionnaires	Demographics: Gender, age, race, BMI. SES: education, annual income. The Traumatic Events Inventory (TEI), The Childhood Trauma Questionnaire (CTQ), BDI, The Modified PTSD Symptom Scale (PSS ¹), The Emotional Dysregulation Scale (EDS) The Positive Affect, Negative Affect Schedule (PANAS), The Dutch Eating Behaviour Questionnaire (DEBQ)	<i>The following factors were found to be significantly associated with emotional eating: Employment (-)**; monthly income (-)**; BMI(+)***, age (-)*, childhood trauma (+)***, adult trauma (+)***, PTSD (+)***, depression (+)***.</i> <i>Findings suggest that depression mediated the association between trauma and emotional eating*** As well as the association between household income and emotional eating* Depression no longer significant when emotional dysregulation was added to the model***.</i>	69
Reagan & Hersch, USA (Detroit), 2005	Influence of demographic factors (race, gender, SES) on binge eating.	N = 983 (573 women and 360 men) Women (58% Black) Men (46% Black)	18 – 97 y (M and SD data not provided).	Quantitative	Cross-sectional	Face to face interviews	Demographics: Age, gender, race/ethnicity, BMI. SES: Income, Education. Depression: 6 questions on a 1 – 5 scale re sadness, worthlessness (no validated measure). Binge eating: one question related to frequency of binge eating (no validated measure).	No significant effect of binge eating on obesity. No significant effect of race/ethnicity on binge eating. <i>Age (-) associated with binge eating, occurring later in life for women than men.</i> <i>Depression (+) associated with frequency of binge eating in women. Education non-significant effect on binge eating.</i> <i>Income (-) associated with frequency of binge eating in women.</i> <i>Time spent in unhealthy neighbourhood environments (+) associated with binge eating in women.</i>	52.3

First author, country, year of publication	Primary focus of article	Sample characteristics (N)	Age	Methodology	Design	Data collection method	Measurement tools	Reported outcome	Quality (%)
Richardson et al., USA (North Carolina), 2015	What factors impact unhealthy eating and obesity in low-income women.	N = 101, females, 67% non-white or Hispanic	18 -44 y. Most under 30 (<i>M</i> and <i>SD</i> data not provided).	Quantitative	Cross-sectional	Questionnaires	Demographics: age race, education, annual household income, ethnicity, 14 item perceived stress scale (PSS ²), 18 item Three factor eating questionnaire (TFEQ), Healthy eating index - 2010 (HEI-2010),	<p><i>Perceived stress weakly (+) associated with obesity**</i>, <i>moderately (+) associated with uncontrolled eating*** and strongly (+) associated with emotional eating***</i>.</p> <p>No indirect pathway found between stress and weight via eating behaviours.</p> <p>Education level and income non-significantly (-) associated with obesity.</p> <p><i>An income of less than \$10,000 weak (+)** association with perceived stress</i>. Education level impact not reported.</p>	71.4
Schmidt, Sweden, 2012	Predictors of health and lifestyle behaviour in university students	N = 152 students (70 male and 81 female).	Age range data not provided. <i>M</i> = 23.4 y (<i>SD</i> = 3.6)	Quantitative	Cross-sectional	Questionnaires	Demographics: gender, age, study course and term, BMI, native language, marital status. SES: mother/father education (a proxy for social class). Perceived Stress Scale (PSS ²), Leisure time exercise questionnaire, TFEQ.	<p><i>Uncontrolled eating significantly related to mother tongue and fathers education*</i>. Uncontrolled eating significantly higher in those in a relationship and students with a foreign background.</p> <p>No significant association between Socio-demographic factors and self-rated mental health.</p> <p><i>Gender was found to be the only significant difference in regards to emotional eating***. Females reported significantly higher levels of stress***</i>.</p>	71.4

First author, country, year of publication	Primary focus of article	Sample characteristics (N)	Age	Methodology	Design	Data collection method	Measurement tools	Reported outcome	Quality (%)
Sims et al., USA (Washington) 2014	The link between executive functioning and negative eating behaviours in obese people.	N = 47 African Americans classified as severely obese (female = 57.4%)	Age range data not provided. <i>M</i> = 45.7 y (<i>SD</i> = 10.8)	Quantitative	Cross-sectional	Questionnaires and tasks (not manipulated)	Demographics: Age, gender, BMI. SES: Years in education, Individual income. The Stroop Color and Word Test, The Wisconsin Card Sorting Test (WCST), The Eating Behaviour Patterns Questionnaire (EBPQ), Beck Depression Inventory – II (BDI-II)	Age, sex, depression and years of education were not found to be significant predictors of emotional eating (Income was not included in the model).	54.7
Troop, UK, 2016	How social rank and rank-related events impact eating pathology.	N = 211, females (77%, students, 81% white)	<i>M</i> = 22.6 y (<i>SD</i> = 6.1)	Quantitative	Cross-sectional	Questionnaires	BMI. The List of Threatening Experiences (LTE). The Eating Disorders Examination Questionnaire (EDE-Q), The Short Depression-Happiness Scale (SDHS), The Social Comparison Rating Scale (SCRS)	<i>Life events involving loss of social status were significantly (+)*** related to eating pathology but only in women reporting self-perceived low rank.</i> Events unrelated to social status were not significantly associated with eating pathology.	50.0

Note. *M* = mean, *SD* = standard deviation, y = years. Weak correlation: $r = 0.1 - 0.3$, Moderate correlation: $r = 0.3 - 0.5$, Strong correlation: $r \geq 0.5$; significant results *Italicised*, * Significant < 0.05 , ** Significant < 0.01 , ***Significant ≤ 0.001 , non-significant > 0.05 . BDI (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), BDI-FS (Beck, Steer, Brown, 2000), BDI-II (Beck, Steer, Brown, 1987), YFAS (Gearhardt, Corbin & Brownell, 2009), WCCL (Lazarus & Folkman, (1984), TEI (Gillespie, Bradley, Mercer, Smith, Conneely, Gapen et al., 2009), CTQ (Bernstein, Stein, Newcomb, Walker, Pogge, Ahluvalia et al. 2003), PSS¹ (Falsetti, Resnick, Resick, Kilpatrick, 1993), EDS (Powers, Stevens, Fani & Bradley, 2015), PANAS (Watson, Clark, & Tellegen, 1988), DEBQ (Van Strien, Frijters, Bergers & Defares, 1986), PSS² (Cohen, Kamarck, Mermelstein, 1983), TFEQ (Stunkard & Messick, 1985), HEI-2010 (Guenther et al., 2013), EBPQ (Schlundt, Hargreaves, Buchowski, 2003), LTE (Brugha, Bebbington, Tennant & Hurry, 1985), EDE-Q (Fairburn & Beglin, 1994), SDHS (Joseph, Lindley, Harwood, Lewis & McCollam, 2004)., SCRS (Allan & Gilbert, 1995).

Table 3

Quality Assessment Ratings for 11 reviewed studies

	Reviewed studies (First author, year)										
	Berenson	Bratanova	Breland	Kaplan	Laitinen	Michopoulos	Reagan	Richardson	Schmidt	Sims	Troop
	2015	2016	2013	2013	2002	2015	2005	2015	2012	2014	2016
Explicit theoretical framework	2	3	2	2	3	3	2	3	3	3	3
Statement of aims/objectives in the main body of report	2	3	2	3	3	3	2	3	2	3	3
Clear description of research setting	3	2	3	3	3	3	3	3	3	2	1
Evidence of sample size considered in terms of analysis	1	0	1	0	0	0	0	0	0	0	0
Representative sample of target group of a reasonable size	2	2	2	2	3	2	2	1	2	1	1
Description of procedure for data collection	3	2	2	2	3	2	2	3	3	2	1
Rationale for choice of data collection tool(s)	3	1	1	1	2	3	1	3	3	2	2

Quality criteria	Berenson 2015	Bratanova 2016	Breland 2013	Kaplan 2013	Laitinen 2002	Michopoulos 2015	Reagan 2005	Richardson 2015	Schmidt 2012	Sims 2014	Troop 2016
Detailed recruitment data	3	2	2	2	3	2	1	2	3	1	1
Statistical assessment of reliability and validity of measurement tools (Quantitative)	0	0	-	-	2	0	0	1	0	0	1
Fit between stated research question and method of data collection (Quantitative)	3	2	-	-	3	3	3	3	3	3	2
Fit between stated research question and format and content of data collection tool (Qualitative)	-	-	2	3	-	-	-	-	-	-	-
Fit between research question and method of analysis	3	3	3	2	2	3	2	3	2	2	2

Good justification for analytical method selected	1	3	1	0	2	3	2	3	3	2	3
Quality criteria	Berenson 2015	Bratanova 2016	Breland 2013	Kaplan 2013	Laitinen 2002	Michopoulos 2015	Reagan 2005	Richardson 2015	Schmidt 2012	Sims 2014	Troop 2016
Assessment and reliability of analytical method (Qualitative)	-	-	0	3	-	-	-	-	-	-	-
Evidence of user involvement in design	0	0	3	3	0	0	0	0	0	0	0
Strengths and limitations critically discussed	2	3	2	2	1	2	2	2	3	2	2
Total Quality Rating	66.6%	61.9%	61.9%	66.6%	71.4%	69%	52.3%	71.4%	71.4%	54.7%	50.0%

Note. 0 = Not at all, 1 = Very slightly, 2 = Moderately, 3 = Completely; Sirriyeh et al., (2011)

Study Methodologies and Publication Context

Two of the studies reviewed utilised qualitative methodology (Breland et al., 2013; Kaplan et al., 2013). All other studies reviewed used quantitative methods. Only one of the studies employed an experimental design (Bratanova et al., 2016).

Six of the 11 reviewed studies were published within the past three years (Berenson et al., 2015; Bratanova et al., 2016; Michopoulos et al., 2015; Richardson et al., 2015; Sims et al., 2014; Troop, 2016). Only two studies had been conducted longer than five years ago (Laitinen et al., 2002; Reagan & Hersch, 2005).

The location of the studies varied. Two studies were conducted in the United Kingdom (UK) (Bratanova et al., 2016; Troop, 2016), one in Finland (Laitinen et al., 2002) and one in Sweden (Schmidt, 2012), the remaining seven in the United States of America (USA).

Measures Used to Assess Psychological Distress, Maladaptive Eating and SES

Measures used in the studies varied greatly. In regards to psychological distress, the Beck Depression Inventory (BDI) was the most popular measure, utilised by three of the studies (Berenson et al., 2015; Michopoulos et al., 2015; Sims et al., 2014). The Perceived Stress Scale (PSS) was applied by two studies (Richardson et al., 2015; Schmidt, 2012). Six other validated measures of psychological distress were used, however, none were employed by more than one of the studies reviewed. Two of the studies utilised non-validated measures of psychological distress (Bratanova et al., 2016; Reagan & Hersch, 2005). Bratanova et al (2016) devised a measure of inequality-induced anxiety, a five-item questionnaire regarding how others may evaluate them based upon material wealth (i.e., I worry: “that others will look down on my possessions; whether I will be accepted by my peers etc”). Responses were required on a 7 point scale (1 = strongly disagree; 7 = strongly agree). Two coders were also used to analyse paragraphs written by participants about their feelings regarding a pending

group discussion with other participants. The paragraphs were written after being told they were more, less or equal to other participants in relation to poverty and deprivation (as part of the experimental manipulation). Coding of the paragraphs was rated on a seven-point scale (1 = no anxiety or apprehension expressed; 7 = a great deal of apprehension and anxiety expressed). Data from The Detroit Area Study (1995) utilised by Reagan and Hersch (2005) created a depression scale utilising responses to six questions about frequency of feeling sad, worthless, hopeless, that everything is an effort, experiencing nervousness and restlessness. Responses were on a one to five point scale (1 = never, 2 = hardly ever, 3 = not too often, 4 = fairly often, 5 = very often) with higher scores indicative of higher frequency and therefore depression. There was considerable variation in the type of psychological distress considered across the studies from anxiety to depression, post-traumatic stress disorder (PTSD) and emotional dysregulation. This is reflected in the lack of consistent measures used across studies in the review. Only one of the studies reviewed, measured more than one aspect of psychological distress (Michopoulos et al., 2015), using the: BDI, the Positive Affect, Negative Affect Schedule (PANAS), the modified PTSD Symptom Scale (PSS), Traumatic Events Inventory (TEI), Childhood Trauma Questionnaire (CTQ) and the Emotional Dysregulation Scale (EDS).

In regards to measurement of maladaptive eating behaviours, of the nine quantitative studies reviewed, two used the Three Factor Eating Questionnaire (TFEQ) (disinhibition subscale) (Richardson et al., 2015; Schmidt, 2012). One of the studies, which was experimental in design, measured calorie consumption following experimental manipulation of perceived social rank (Bratanova et al, 2016). One of the studies used an unvalidated measure asking a single question (Reagan & Hersch, 2005). Participants were asked “How often do you have an eating binge in which you eat a lot of food within a few hours?” with seven possible responses provided (never, less than once a month, once a month, 2 -3 days a

month, weekly, 2-3 days per week, most days). Despite five additional studies using a validated measure of eating behaviours (Yale Food Addiction Scale (YFAS), Dutch Eating Behaviour Questionnaire (DEBQ), Eating Behaviours Patterns Questionnaire (EBPQ), Eating Disorders Examination Questionnaire (EDE-Q), Ways of Coping Checklist (WCCL)), none of these measures was utilised by more than one of the studies reviewed. Seven of the nine studies also measured and reported on BMI alongside an eating behaviour measure; four used self-report height and weight (Laitinen et al., 2002; Michopoulos et al., 2015; Reagan & Hersch, 2005; Schmidt, 2012), one used medical records (Berenson et al., 2015) and two did not elaborate on their data collection method for obtaining BMI (Troop, 2016; Sims et al., 2014).

For measures used to ascertain SES the most popular method utilised by six studies was an assessment of both education (level or years) and income (individual or household). A combination of level of education, employment status and a measure of change in social class was used by one study to measure SES (Laitinen et al., 2002). One study considered parent's education level as a proxy for SES (Schmidt, 2012). A measure of perceived social status and social comparison was utilised by Troop (2016). One study devised their own 7 point scale for individuals to rate their SES prior to allocation to experimental conditions; the scale responses were from 1 = lower/working to 7 = upper wealthy (Bratanova et al., 2016). This study then experimentally manipulated perceived social rank through information on the social standing of others and feedback related to how their level of deprivation compared to counterparts in the study (higher, lower or equal deprivation/poverty).

Procedures

All 11 studies reviewed provided some information regarding their procedures for data collection and recruitment. The majority of the papers provided moderate to complete information, however, three papers provided only basic information regarding recruitment

procedures, obtaining a score of one on the QATDSDD (Reagan & Hersch, 2005; Sims et al., 2014; Troop, 2016). In regards to data collection procedures, only one paper obtained a score of one due to providing minimal information (Troop, 2016).

Three of the studies were conducted within student populations. (Bratanova et al., 2016; Schmidt, 2012; Troop, 2016). Four were conducted in health care settings (Berenson et al., 2015; Breland et al., 2013; Michopoulos et al., 2015; Sims et al., 2014). Three were community-based samples (Kaplan et al., 2013; Reagan & Hersch, 2005; Richardson et al., 2015). One of the studies reviewed was a longitudinal birth cohort sample (Laitinen et al., 2002).

Summary of Results on the Association between SES and Maladaptive Eating

The collated findings indicate a link between SES and maladaptive eating. Of the nine quantitative studies reviewed, six found a significant association between lower SES factors and higher maladaptive eating behaviours (Laitinen et al., 2002; Michopoulos et al., 2015; Reagan & Hersch, 2005; Schmidt, 2012; Troop, 2016; Bratanova et al, 2016). Each of the six studies however utilised different measures of SES and maladaptive eating behaviours.

Michopoulos et al, (2015) found lower employment and lower monthly income to be significantly associated with higher emotional eating. Schmidt (2012) found fathers' education level to be significantly related to uncontrolled eating however they found no SES factors to be significantly related to emotional eating. Laitinen et al. (2002) found that long history of unemployment (for both men and women) and low level of occupational education (for men) was related to stress-related eating behaviours. Reagan and Hersch (2005) found higher income to be significantly associated with lower levels of reported binge eating for women however, this study was found to have one of the lowest overall quality ratings. The only experimental study within the review found that induced perceived poverty resulted in a

change to eating behaviours by increasing food intake compared to participants in the induced perceived wealth condition (Bratanova et al., 2016).

Two of the nine studies found no significant relationship between SES factors measured and their chosen measure of maladaptive eating (Berenson et al., 2015; Sims et al., 2014). Berenson et al. (2015) did not find a significant relationship between SES factors and food addiction. However, the information regarding data collection method for the SES variables in this study is limited. The study states income and education level as self-report; however, the structure of these questions or response options for participants are not provided. Within the data analysis, responses are split into only two categories for education (Some high school classes, enrolled in /graduate of high school, Some college course work/degree) and only three categories for annual income with a low cut-off (<\$15,000; >\$15,000; “Do not know”). This was also the only reviewed study to consider food addiction as the maladaptive eating behaviour measured. The level of food addiction was relatively small at 2.8% equating to only 30 individuals. Previous studies with college students and middle-aged women have yielded food addiction prevalence between 6.7% and 11.4% (Flint et al., 2014; Gearhardt, Corbin, & Brownell, 2009; Pedram et al., 2013). Sims et al. (2014) found years of education not to be significantly linked to emotional eating. The final study by Richardson et al. (2015) did not report on the relationship between their measure of SES (income and level of education) and maladaptive eating (uncontrolled eating and emotional eating).

Summary of Results on the Association between Psychological Distress and Maladaptive Eating Behaviours

The reviewed studies indicate that increased psychological distress is associated with an increase in maladaptive eating. Of the nine quantitative studies, eight found psychological distress to be significantly associated with maladaptive eating behaviours (Richardson et al.,

2015; Michopoulos, 2015; Berenson et al., 2015; Reagan & Hersch, 2005; Troop, 2016; Bratanova et al., 2016; Laitinen et al., 2002; Schmidt, 2012). Richardson et al. (2015) found that perceived stress was positively associated with both emotional and uncontrolled eating. Michopoulos et al. (2015) found that both trauma (in both adulthood and childhood) and depression were significantly related to emotional eating. Berenson et al. (2015) found a significant positive relationship between depression and food addiction. Reagan and Hersch (2005) found that depression was significantly related to increased binge eating (in women only). Troop (2016) found that life events related to loss of social status were significantly associated with an increase in negative eating pathology. Bratanova et al (2016) found anxiety to be significantly associated with increased calorie consumption following experimental manipulation to increase perceived social inequality. Laitinen et al. (2002) reported a significant relationship between stress and maladaptive eating. Schmidt, (2012) found that stress and emotional eating were significantly related but only in women. Both of the qualitative studies reviewed identified themes of stress leading to maladaptive overeating to cope (Breland et al., 2013; Kaplan et al. , 2013). The remaining quantitative study reviewed, found no significant association between depression and emotional eating however they comment on depression within their sample being relatively low (Sims et al, 2014).

Summary of Results on Psychological Distress as an Indirect Pathway from SES to Maladaptive Eating

Emerging evidence from the studies reviewed suggests that psychological distress is a mediating factor in the relationship between SES and maladaptive eating. Of the two qualitative studies reviewed both identified themes of stress directly related to low SES, poverty and related discrimination. They also highlight the employment of eating behaviours, to cope and provide comfort as a direct result (Breland et al., 2013; Kaplan et al., 2013). The study by Kaplan et al. (2013) identified specific maladaptive eating behaviours of

uncontrolled eating, erratic eating and overeating as methods employed to self-soothe or self-medicate the stress induced by socio-economic deprivation. These qualitative studies provide support for the role of psychological distress as a mediating factor between SES and maladaptive eating behaviours.

Of the nine quantitative studies reviewed, four found explicit support for this mediating pathway whereby lower SES results in higher maladaptive eating due to increased psychological distress (Bratanova et al, 2016; Laitinen et al., 2002; Troop, 2016; Michopoulos et al., 2015). The experimental study by Bratanova et al. (2016) found that experimentally-induced social inequality and perceived poverty led to a change in eating behaviours of increased food intake (relative to a condition of induced perceived wealth) through a process of increased anxiety. Troop (2016) found that maladaptive eating behaviours were significantly associated with life events which involved loss of social status, but only in women who reported perceived low rank. The overall quality rating for this study however, was the lowest of the reviewed papers (50%). Laitinen et al.'s (2002) longitudinal birth cohort study found that emotional factors aged 14 and stress-driven eating were predictors of higher BMI at age 31 years. Michopoulos et al. (2015) found that depression mediated the relationship between low income and emotional eating. However, depression was no longer significant in the model when emotional dysregulation (fluctuations in mood) was added. This indicates that possible mechanisms underlying psychological distress may play an important role within the pathway between SES and maladaptive eating to cope.

Of the remaining five studies, four found partially supportive associations between the variables of SES, psychological distress and maladaptive eating (Berenson et al., 2015; Reagan & Hersch, 2005; Richardson et al., 2015; Schmidt, 2012). In these papers, no additional specific analysis was run to consider the indirect pathway between SES and maladaptive eating via mediating factors of psychological distress. The final study did not

find SES factors or psychological distress to be significantly associated with the maladaptive eating behaviour measured (Sims et al., 2014). This study, however, was found to have one of the lowest overall quality ratings of the reviewed papers (54.7%). The sample size was also low ($N = 47$) and consisted of only African American participants classified as severely obese. These factors may affect the ability to draw meaningful and reliable interpretations from the studies results.

Demographic Factors

Ethnicity. Of the studies which measured and commented on ethnicity, seven consisted of participant samples of predominantly non-white ethnicity, described as either Hispanic or Black (Berenson et al., 2015; Breland et al., 2013; Kaplan et al., 2013; Michopoulos et al., 2015; Reagan & Hersch, 2005; Richardson et al., 2015; Sims et al., 2014). One study reported a predominantly white sample (Troop, 2016). Three studies did not report on participants' ethnicity. These were conducted in Finland, Sweden and the UK (Schmidt, 2012; Bratanova et al., 2016; Laitinen et al., 2002).

Of the four studies with mixed ethnicity (Berenson et al., 2015; Richardson et al., 2015; Michopoulos et al., 2015; Reagan & Hersch, 2005), only one found a significant effect of race on eating behaviour (Berenson et al. 2015). They found differences in food addiction symptom count between ethnicities, with Black and White women having a higher symptom count than Hispanic women. None of the studies with mixed ethnicity participants conducted analysis to assess if ethnicity was significantly associated with SES.

Gender. Seven of the studies reviewed were conducted with both female and male participants (Reagan & Hersch, 2005; Michopoulos et al., 2015; Troop, 2016; Schmidt, 2012; Laitinen et al., 2002; Breland et al., 2013; Kaplan et al., 2013; Sims et al., 2014). Four studies utilised female participants only (Berenson et al., 2015; Bratanova et al., 2016; Richardson et al., 2015; Troop, 2016). Of the six quantitative studies which sampled both men and women,

four found significant gender differences. Reagan and Hersch (2005) found that depression was significantly associated with binge eating but only in women, furthermore binge eating was found to reduce as income increased for female participants only. The conclusion of the study was that social factors play a greater role for women than men in regards to the maladaptive eating behaviour of binge eating. The sample size however for males in this study was small and was highlighted as a limitation to the findings. Troop (2016) found that life events involving loss of social status were related to maladaptive eating behaviours but only in women who also reported self-perceived low rank. Schmidt (2012) found gender to be the only significant factor associated with emotional eating, with females reporting higher levels of stress. Laitinen et al. (2002) found gender to be the best predictor of stress-related eating. Unlike in the other studies, they found men rather than women to be more impacted by SES factors. Unemployment and low occupational education were found to be significantly associated with stress-related eating in men. For women, unemployment was still found to be significant, however, emotional support was found as the most significant predictor of stress-related eating. This study, however, did not measure income which has been associated with female predictors in one of the other studies (Reagan & Hersch, 2005). Against the general trend, Laitinen et al. (2002) also found that for men, having a university degree (an indicator of higher SES) was also a significant predictor of increased stress related eating. Only one study found no significant difference between gender (Sims et al., 2014). This study was found to have a relatively low-quality rating of 54.7% and a small sample size of only 47 participants. The final study which consisted of both female and male participants was experimental in design. The randomly allocated experimental groups did not significantly differ in terms of gender distribution. Gender was included as a covariate during later analysis and was reported to have no significant impact on the overall findings (Bratanova et al., 2016).

Additional Variables

Four of the reviewed studies indicated additional mechanisms which may play important roles in understanding the relationship between SES factors and maladaptive eating behaviours. Sims et al. (2014) and Michopoulos et al. (2015) indicated that mechanisms such as emotional dysregulation and inhibition may play important roles in the mediation between SES factors and maladaptive eating behaviours. Schmidt (2012) found fathers' education level to be significantly positively associated with physical exercise suggesting that higher SES increases the propensity to do physical exercise, however, whether this is due to increased opportunity or increased motivation to undertake physical exercise is unclear.

Discussion

Summary of Findings

The review paints a picture of lower SES being a causal factor in poor weight management, as a result of increased psychological distress and the subsequent utilisation of maladaptive eating behaviours. Of the 11 studies reviewed, eight found that real or perceived low SES was associated with higher maladaptive eating behaviours (Breland et al., 2013; Kaplan et al., 2013; Laitinen et al., 2002; Michopoulos et al., 2015; Reagan & Hersch, 2005; Schmidt, 2012; Troop, 2016, Bratanova et al., 2016). Nine of the 11 studies found psychological distress to be significantly associated with maladaptive eating behaviours (Breland et al., 2013; Kaplan et al., 2013, Richardson et al., 2015; Michopoulos et al., 2015; Berensen et al., 2015; Reagan & Hersch, 2005 Troop, 2016, Bratanova et al., 2016; Laitinen et al., 2002). Six of the 11 studies reviewed found explicit support for the mediating role of psychological distress in explaining the relationship between SES and maladaptive eating behaviours (Breland et al., 2013; Kaplan et al., 2013; Michopoulos et al., 2015; Troop, 2016; Bratanova et al., 2016, Laitinen et al., 2002). Whilst all of the studies reviewed met the inclusion criteria, due to variation in the individual study questions, the analysis completed

did not always allow for full exploration of the role that psychological factors played in the relationship between SES and maladaptive eating behaviours. Preacher and Hayes (2004) propose that it is possible for a significant mediating relationship to be present even when individual correlations between key variables are not indicated to be significant, however further analysis is required to reveal these relationships and indirect pathways. It is possible that had such additional analyses been conducted, significant results for the mediating role of psychological distress in the relationship between SES factors and maladaptive eating behaviours could have been found. Due to the primary aims of the studies in question, such analysis was not considered or deemed appropriate at the time. It may be important to note that of the three studies that scored highest in regards to quality assessment, one found strong support for the model (Laitinen et al., 2002), with two finding only partial support for the model (Richardson et al., 2015; Schmidt, 2012).

A comprehensive review, with a combined participant pool of 7.7 million, found that people living in areas of high-income inequality are at increased risk of poor self-rated health and early mortality, independent of their objective SES, age, and sex (Kondo et al., 2009; Rowlingson, 2011). The mechanism proposed for this is that lower perceived social status leads to anxiety and competition which in turn impacts health and health-related behaviours. Two of the studies reviewed looked at subjective measures of perceived social status as an alternative or in addition to objective measures of SES such as education or income. (Troop, 2016; Bratanova et al., 2016). Both of these reviewed studies found support for the adapted model based upon Hemmingsson's (2014) socio-emotional model as depicted in Figure 1, which indicates a causal pathway whereby lower SES leads to obesity via increased psychological distress and subsequent maladaptive eating behaviours. In light of this, it may be important for future research to consider the use of both objective and subjective measures of SES and social rank. Within this, it is important to highlight the potentially malleable

nature of perceived social rank, as demonstrated by the successful manipulation of this variable within the study by Bratanova et al. (2016). Furthermore, objective SES is not a static position, in so much as peoples SES can change (e.g through marriage). Someone whos SES has shifted may, in turn, perceive their social rank differently to someone whose SES has been more consistent. Exploration of these factors around the perception of social rank and change related to SES factors may provide a greater understanding of SES as a construct and its impact on wellbeing.

Gender has been shown to be one of the strongest socio-demographic factors that predict lifestyle behaviours (Ford et al., 2008). Of the six quantitative studies which looked at both male and female participants, four found a significant gender difference between participants (Reagan & Hersch, 2005; Troop, 2016; Laitinen et al. , 2002; Schmidt, 2012). These differences related directly to the impact of SES and psychological distress on the propensity to undertake maladaptive eating behaviours. Within one study, gender was the only significant predictor found of emotional eating (Schmidt, 2012). Three of the four studies indicated women as more significantly affected by SES factors, psychological distress and emotional eating. Only one of the studies (Laitinen et al., 2002) found the eating behaviours of men to be more affected by SES. Gender roles are changeable dependent upon societal norms and pressures, for example, women in more recent generations could be perceived to have increased pressure regarding working roles and as breadwinners, subsequently, roles and pressures for men are also changing (Kite, 2001). This may be important when considering the validity of findings over time and across cultures.

Laitinen et al. (2002) found expected trends between low occupational education, long-term unemployment and stress-related eating in men. Interestingly, they also found that men with degrees had significantly higher stress related eating. Within the paper, they reflected on the employment crisis of the 1990's which impacted those with degrees for the

first time. Up until recent history, higher education generally equated to a good job, pay security and higher social status. However, it is proposed that social changes such as increasing numbers of individuals with degrees, reduced jobs availability and times of economic crisis/recession impacted the results of the study. It is interesting to consider that economic and social changes are occurring at different rates even within similarly developed Western countries. This raises important questions regarding the validity of research in terms of its long-term applicability and generalisability across cultures. Consideration of wider issues regarding the economy and cultural expectation may be important to consider in the relationship between SES factors, psychological distress and emotional eating.

Sample Size, Participants and Procedures

The participants sampled varied greatly across the studies reviewed with quantitative studies ranging from $N = 47$ to $N = 5150$. Two of the quantitative studies had relatively small sample sizes of less than 54 (Bratanova et al., 2016; Sims et al., 2014). None of the studies provided information on sample size in regards to how this related to adequate power for their analysis to reach statistical significance. All 11 studies provided information in regards to their data and recruitment procedure; however, the level of detail provided varied greatly across the studies.

Choice of Measurement Tools

The range of measurement tools utilised across the reviewed studies was vast. Whilst SES measures of income and education were commonly utilised, even within this, variation occurred. For example, education being measured in years vs level achieved and income being assessed as individual income versus a calculation of household income. These differences in measurement may have a significant impact on generalisability of findings from one to study to another. Three of the studies used self-devised or un-standardised

measures (Bratanova et al., 2016; Reagan & Hersch, 2005; Laitinen et al., 2002). The validity of these measures and therefore results are questionable.

Summary of Quality Assessment (Table 3)

The overall quality of the studies was moderate, except for three studies which scored below 55% (Reagan & Hersch, 2005; Sims et al., 2014; Troop, 2016). For some of the items on the QATSDD tool, the majority of the studies received a score of zero. For example, Item 15, “evidence of user involvement in design”, for which nine of the studies scored zero. It could be argued that some items potentially hold more weight in regards to the impact of quality. For example, one such item, number four “Evidence of sample size considered in terms of analysis” resulted in nine of the studies scoring zero whilst the remaining two obtained a score of one. There were also a number of items on the QATSDD which all studies scored highly on (2 or 3 points) including “Explicit theoretical framework” and “Statement of aims/objectives in the main body of the report”.

Quality Assessment Tool

The advantage of using the QATSDD is that it provides one tool for diverse methodologies, allowing for comparison and ease of interpretations across studies. The tool provides a guide to assist the reviewer in scoring to ensure consistency. However, an element of professional judgment is still required which could be viewed as a limitation due to possible bias. In the case of this review, a second quality assessor was utilised to add an extra level of assessment to reduce the chance of bias in this regard. A limitation of the quality assessment tool utilised is that the items included are not weighted in regards to importance. As such, it is possible for a study to score low on some fundamental factors and still obtain a high overall rating. When comparing overall scores’ with another study this may falsely indicate robust methodology.

Methodological Considerations

The relatively small number of papers reviewed ($N = 11$) have been increasingly published in very recent years, which highlights the review as timely in helping to guide future research in this area. A further strength of the review is its incorporation of studies from both qualitative and quantitative fields of research which provides a breadth to the current understanding of the relationships being considered. Eight of the 11 studies reviewed were cross-sectional in design, looking at one time point based on self-report questionnaire methodologies. The nature of these studies makes it impossible to infer causality. This may be particularly important to consider when the experimental and qualitative studies reviewed provided a more coherent narrative of support for the model as depicted in Figure 1 based on the proposed socio-emotional model of obesity by Hemmingsson (2014).

There are however a number of limitations of this review. Despite an inclusive and comprehensive search strategy, some relevant papers may not have been identified. The studies found for review varied greatly on a number of factors, including types of psychological distress and maladaptive eating behaviours measured. In turn, this makes drawing conclusions and generalisability challenging. Unfortunately, due to the lack of available data to date, a more cohesive review of studies which considered, for example, only depression and emotional eating, would not have been possible at this time. Through this, however, the review does highlight the complexity of the interactions at play and in turn areas for potential focus moving forward.

A further limitation is the diversity of populations sampled across the studies. One of the qualitative studies utilised a population who had a diagnosis of diabetes (Breland et al., 2013). Seligman, Bindman, Vittinghoff, Kanaya and Kushel (2007) found that individuals with severe food insecurity were more likely to have diabetes than those without food insecurity. It is possible that individuals with this diagnosis have a different relationship with

eating and eating behaviours than the general population, questioning the generalisability of the studies findings.

Generally, a mixed method review (qualitative and quantitative) could be viewed as both positive and problematic. A strength is that it does not exclude a particular methodology which could add value, however, combining and making a meaningful synthesis of research which comes from very different epistemological assumptions is challenging (Gough, 2015). The current review acknowledges these difficulties and aimed to address some of these concerns by employing the use of a quality assessment tool specifically designed for mixed methodologies (Sirriyeh et al., 2011).

A further limitation is that despite attempts to reduce reviewer bias through the use of a second assessor, possible bias due to the knowledge of additional study factors is possible. Recommendations suggest that identifiable data such as authors, associated institutions, study title and journal names etc should all be removed to reduce any such bias, which was not done during this review process (Antman, Lau, Kupelnick, Mosteller & Chalmers, 1992).

The current review considered maladaptive eating rather than BMI as its primary variable. This was chosen due to maladaptive eating being highlighted as the causal mechanism in the original model proposed by Hemmingsson (2014). Whilst eating behaviours are important and have been shown to be significantly linked to higher BMI (Geliebter & Aversa 2003) it is possible that a review question and search strategy focused on weight outcomes may have provided an alternative narrative regarding the link with SES factors and the role of psychological distress in this relationship.

The review criteria stated that studies must have been conducted within Western developed countries as outlined by the boundaries of Hemmingsson's model which explicitly states North America and Europe. However, even within these Western developed countries,

there is likely to be great variance, especially when considering differences in education, health care and economic factors. All of these are also likely to impact SES factors. This may further limit the ability for the review to draw conclusions across reviewed studies and create generalisable conclusions.

Theoretical Implications

The findings of the review suggest that as depicted in Figure 1 lower SES may increase vulnerability to psychological distress with the subsequent utilisation of maladaptive eating behaviours to cope. The findings, therefore, support some of the associations within the causal socio-emotional model of obesity proposed by Hemmingsson (2014) in that psychological distress and subsequent maladaptive eating behaviours may partly explain the relationship between lower SES and obesity. It has been proposed that individuals with lower SES have access to less intrapersonal and interpersonal resources to help them manage difficult life events and subsequent distress (Lazarino, Hamer, Stamatakis & Steptoe, 2012; Matthews & Gallo, 2011). This suggests, as in Hemmingsson's model (2014), that access to external (social support) and internal resources (resilience, self-esteem) may act as protective factors. In the absence of such resources, additional coping strategies must be employed. Research indicates that certain maladaptive eating behaviours such as emotional eating to be associated with certain coping styles, specifically emotion-oriented and avoidant-distraction coping (Spoor, Bekker, Strien & Heck, 2006). The current review would support these theories regarding the subsequent vulnerability posed by lower SES.

Whilst not the focus of this review, it is important to consider that people can respond to adversity in a variety of ways and as such, it is possible that there may be pathways by which the variables of SES and psychological distress are also linked to maladaptive eating in the form of food restriction. Furthermore, it may be that individuals use both restrictive and over-eating strategies interchangeably, impacted by a wealth of factors, such as the intensity

or context of distress. Despite the review indicating evidence for the proposed pathways between lower SES, psychological distress and maladaptive eating behaviours, holding in mind the complexity of human responses may be important for future exploration of the topic area.

Clinical Implications

The results of this systematic review suggest that psychological factors play an important role in the relationship between low SES and maladaptive eating. As the link between maladaptive eating and obesity is well established (Geliebter & Aversa (2003), the findings of the review suggests that psychological factors should be accounted for in both weight management interventions and preventative public health strategies. It may be beneficial to focus on fostering alternative positive coping strategies to manage distress amongst individuals with lower SES and in communities with higher levels of socio-economic deprivation.

Future Directions

The themes emerging from this review warrant further research. Future studies should examine the complex interplay of the factors highlighted including both subjective and objective measures of SES, gender difference, specific populations/cross-cultural comparisons as well as multiple aspects of psychological distress. Longitudinal studies could provide additional evidence into the causality of variables at play but also provide insight into how changes may map onto wider societal and economic climates. The consistency of measures utilised will also be important for further review and meaningful summary of findings. Within the original model proposed by Hemmingsson (2014) individual “buffer” factors such as resilience are proposed to be a mechanism by which some individuals are protected from adverse effects of factors such as low SES. It may, therefore, be helpful for future research in this area to incorporate potential protective factors into their design. This

may provide a more tangible short-term intervention for individuals already exhibiting difficulties regarding maladaptive eating and obesity.

Conclusions

The findings of the review indicate that the relationship between SES and maladaptive eating behaviour are likely to be partly explained through increased emotional distress. Lower SES appears to impact psychological distress which in turn leads to increased maladaptive over-eating behaviours to cope. From a preventative intervention perspective, strategies to address inequality, unemployment and poor education may have a positive long-term impact upon unhelpful eating behaviours. In addition, strategies to enhance alternative positive coping strategies for managing distress may be helpful for individuals and families with lower SES. The review also highlights the complex interplay of factors with gender differences seeming to be significant. Wider social and economic factors may also be influential in relation to changing gender roles and inequality. It is important to understand these factors in order to support communities and individuals, especially during times of change on social, political and economic fronts.

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v. Chapter Two

How does socio-economic disadvantage influence body weight? A cross-sectional study to examine the mediating role of psychological distress and maladaptive coping strategies

The empirical paper will be submitted to the British Journal of Health Psychology for publication.

Abstract

Introduction: Lower socio-economic status (SES) is robustly associated with obesity; however, the underpinning psychological mechanisms remain unclear. According to a recent theoretical model (Hemmingsson, 2014), socio-economic disadvantage increases psychological distress which, in turn, promotes maladaptive coping behaviours, such as emotional eating, and ultimately obesity. Furthermore, resilience defined as the ability to “bounce back” from stressors, is thought to moderate the association between socio-economic disadvantage and distress, thus providing a protective role. The current study sought to test these predictions. **Method:** The study recruited 150 adults aged 18 to 65 years from a range of socio-economic backgrounds. SES was measured through participants self-reported income and education level. Psychological distress, emotional eating, and resilience were assessed using the Depression, Anxiety and Stress Scale, the Dutch Eating Behaviour Questionnaire, and the Brief Resilience Scale, respectively. Self-reported height and weight were also obtained to calculate body mass index (BMI). **Results:** As predicted, bias-corrected bootstrapping indicated a significant indirect effect of SES on BMI via psychological distress and increased emotional eating; specifically, lower SES was associated with higher distress, higher distress was associated with higher emotional eating, and higher emotional eating was associated with higher BMI. However, contrary to prediction, resilience was not a significant moderator of this association. **Conclusion:** These findings provide a novel insight into the relationship between SES and obesity, suggesting that it may be partly explained by psychological distress and subsequent emotional eating as a coping strategy. Targeting these maladaptive coping behaviours in response to distress may help reduce obesity in low-income populations.

Key Words: Socio-economic status (SES), psychological distress, emotional eating, resilience.

Introduction

The increasing rates of obesity have been labelled as an “epidemic”. National statistics show that 25% of the population is obese, a rate which has increased by 10 % over the last decade (NHS Choices, 2013). In the UK, costs to the National Health Service associated with obesity or being overweight are projected to reach £10 billion by 2050, with wider economic costs (such as days of employment missed) expected to reach £50 billion per year (Foresight, 2007). Current weight management strategies primarily focus upon two areas, improving the quality of dietary intake and reducing sedentary lifestyle (Parsons, Power, Logan, & Summerbelt, 1999). However, their success has been limited, especially in regards to long-term maintenance of weight loss (Johansson, Neovius & Hemmingsson, 2014).

Lower socio-economic status (SES) has been robustly linked to poorer health outcomes such as reduced life expectancy and years of life without disability (Marmot et al., 2010). Socio-economic disadvantage incorporates factors related to income inequality/disparities, broader economic outcomes, inequalities between different socio-demographic groups, the geographical distribution of inequalities and educational attainment (Cederberg, Hartsmar & Lingarde, 2009). One specific health outcome which has been found to be consistently associated with lower SES in high-income countries is obesity (Pampel, Denney & Krueger, 2012, Parsons et al., 1999). Studies have indicated that working-class adults and children are more likely to be obese than their middle or upper-class peers (National Audit Office, 2001; Wardle, Waller, & Jarvis, 2002). Wardle, Brodersen, Cole, Jarvis and Boniface (2006) found that the prevalence of obesity was highest among children and adolescents with significant socio-economic and ethnic inequalities.

Currently, little is known about the underlying psychological mechanisms which may explain the relationship between lower SES and obesity (Stamatakis, Primatesta, Chinn,

Rona, & Falaschetti, 2005). Proposed factors such as the availability of low-cost food do not fully account for this relationship. A recent systematic review shows little evidence for the association between obesity and the availability of low-cost, unhealthy foods (Cobb et al., 2015). Averett and Smith (2014) longitudinally examined the relationship between differing types of financial hardship and obesity. The study found a correlation between financial hardship and weight gain. They also highlighted the role of “unobservable factors” in explaining the relationship, these might include psychological factors. There is very little previous literature into the psychological mechanisms which may underpin the relationship between low SES and obesity, therefore our understanding of the nature of these influences is currently limited. By increasing the understanding of the key drivers of behaviours which lead to weight gain we may be better placed to establish which interventions will be most helpful and for whom.

A recent theoretical model by Hemmingsson (2014) has proposed a causal pathway between SES and obesity that is mediated by psychological factors. Key pathways outlined within Hemmingsson’s model in relation to adult obesity are illustrated in Figure 1. The model considers the direct impact of socio-economic disadvantage on higher bodyweight in children, adults and family units. Lower SES is postulated to be associated with increased psychological distress which in turn leads to maladaptive eating behaviours, such as emotional eating and increased consumption of comfort foods. These behaviours, in turn, are thought to result in higher body weight. According to the model, this pathway is further reinforced due to the social, psychological, emotional and behavioural consequences of obesity which lead to further psychological distress and maladaptive eating behaviours, thus creating a cyclic mechanism which perpetuates the difficulties. The model also proposes that positive factors such as high resilience act as a protective buffer, reducing the propensity for weight gain and obesity.

A key prediction of this model is that low SES is causally related to obesity via increased levels of emotional distress and in turn maladaptive behaviours involving eating. Resilience is proposed to act as a buffer between low SES and psychological distress which may explain why some individuals from socially deprived settings maintain a healthy weight. Resilience in this context has been defined as an individual's capacity to cope with stressors and to withstand the potential depressive consequences of such stressors (Luthar & Cicchetti 2000). Studies have indicated high levels of psychological resilience as a factor which is correlated with lower incidences of depression (Fredrickson, Tugade, Waugh & Larkin, 2003; Sharpley, 2016). In relation to obesity, Stewart-Knox, Duffy, Bunting, Parr, Vas de Almeida and Gibney (2012) found low resilience to be an independent predictor of larger waist circumference.

Whilst Hemmingsson's model as depicted in Figure 1 has yet to be considered in its entirety, there is some empirical support for the proposed relationships between these variables. Notably, several studies have shown a link between socio-economic disadvantage (i.e., income inequality and lower social status) and psychological distress, such as higher rates of depression and lower mental wellbeing in individuals with lower SES (Lorant et al., 2007; Pickett & Wilkinson, 2015). Furthermore, experimental studies which have induced negative emotions in participants have shown a subsequent increase in calorie consumption relative to a control condition (Geliebter & Aversa, 2003). Recent qualitative studies have shown that people identify eating as a self-therapeutic intervention (Von Essen & Martensson, 2014). Studies have also indicated that utilisation of emotional eating strategies results in higher BMI. One such longitudinal study by Laitinen, Ek, and Sovio (2002) found that emotional factors and stress-driven eating at aged 14 were predictors of higher BMI at age 31 years.

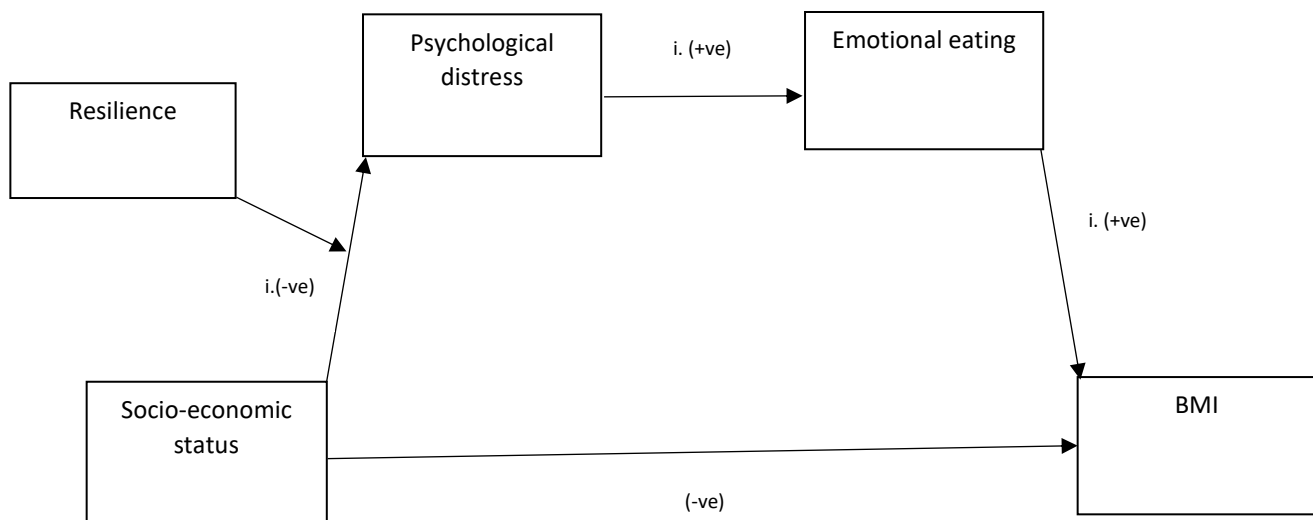


Figure 1. Schematic representation of the hypothesised relationship between SES and BMI via psychological distress and emotional eating operating in series (pathway i). Also showing resilience as a moderator between SES and psychological distress.

Study Aim

The proposed research aims to test predictions that are derived from the socio-emotional model of obesity (Hemmingsson, 2014). Primarily, it will consider whether the relationship between SES and BMI is explained by two mediators, psychological distress and emotional eating, operating in series (i.e. whereby higher psychological distress is associated with greater use of emotional eating as a coping strategy which, in turn, predicts higher BMI). It will also aim to determine whether resilience acts as a protective buffer, moderating any relationship between lower SES and psychological distress.

Hypotheses

1. Lower levels of SES will be associated with higher psychological distress, higher emotional eating, and higher BMI.

2. The relationship between socio-economic disadvantage and BMI will be mediated by psychological distress and emotional eating acting as serial mediators (i.e. whereby higher psychological distress is associated with greater use of emotional eating as a coping strategy which, in turn, predicts higher BMI)
3. Resilience will moderate the relationship between lower SES and psychological distress. Individuals who are high in resilience will cope better with socio-economic disadvantage and so will be protected against increased psychological distress and subsequent maladaptive eating.

Method

Participants

One hundred and fifty participants were recruited in total between April 2016 and December 2016. Participants were recruited through an Urban Community and Neighbourhood Centre (UCAN) situated in Bolton, Greater Manchester, which provides support and advice to local residents within an identified geographical area of socio-economic deprivation (Indices of Multiple Deprivation: Briefing Report, 2010). Advertisements for the study (see Appendix B) were placed in the centre and on the centre's Facebook page. The study further recruited through online advertisements on the University of Liverpool announcements and through social media (Facebook and Twitter).

Eligibility for the study required participants to be working age adults between the ages of 18 and 65 years with a good level of English language skills. Due to a measure of SES being assessed in part via average current income, it was felt that the responses of individuals over 65 years of age may not accurately represent their SES due to retirement.

Ethical approval was obtained from the University of Liverpool's Research Ethics Committee (Ref: IPHS-1516-LB-174) (see Appendix C). All participants were provided with written information regarding the nature and purpose of the study to consider before

volunteering to participate (see Appendix D). Following this, all participants were required to provide consent prior to commencing the questionnaires within the study (see Appendix E). A written debrief and additional signposting for support (if required) were also provided at the end of the study (see Appendix F).

Measures

Demographic information. Each participant was asked to provide the following demographic information: age, gender, ethnicity and the first 3 characters of their postcode (as a general geographical reference point) (see Appendix G).

Measure of Body Mass Index (BMI). Participants were asked to provide self-report data of weight (kg/stone lbs) and height (cm/ft) to calculate body mass index (BMI) (see Appendix G). Self-reported BMI data has been found to be highly correlated with measured BMI (Pursey, Burrows, Stanwell & Collins, 2014; Ng et al., 2011). Published cut-offs regarding BMI were used to provide both continuous and categorical data for analysis (underweight = below 18.5, normal weight = 18.5 - 24.9, overweight = 25 - 29.9, obese class one = 30 - 34.9, obese class two = 35 - 39.9, obesity class three = 40 and above), (World Health Organisation, 2000).

Measure of SES. Current SES is regularly measured using a combination of current income, level of educational attainment and employment status (Cederberg, Hartsmar and Lingarde, 2009). A measure of SES was gathered by self-report of employment status (employed full-time, employed part-time, unemployed looking for work, unemployed not looking for work, retired, student, unable to work due to health or disability, housewife/husband, voluntary employment), total household income (9 – point scale: 1 = < £5,200, 2 = £5,200 - £10,399, 3 = 10,400 - £15,599, 4 = £15,600 - £20,799, 5 = £20,800 - £25,999, 6 = £26,000 - £36,399, 7 = £36,400 - £51,999, 8 = £52,000 - £77,999, 9 = >£78,000) and level of education (8-point scale: 1 none, 2 GCSE grade D or below, 3 GCSE

grade C or above, 4 A-level or equivalent, 5 university degree or equivalent, 6 postgraduate qualification or equivalent, 7 Masters or equivalent, 8 PHD or equivalent) (see Appendix H). The items have been used as reliable predictors of calculating SES (Clark et al., 2007).

Measure of Emotional Eating. The Dutch Eating Behaviour Questionnaire (DEBQ) was used, consisting of the 13-item version of the Emotional Eating Scale (Van Strien, Frijters, Bergers & Defares, 1986) (see Appendix I). Items are rated on a 5-point scale (1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = very often), and the total scale score is the mean of the responses to these items. The measure has been found to possess high internal consistency and factorial validity ($\alpha = .94$) (Van Strien, Frijters, Bergers & Defares, 1986).

Measure of Psychological of Distress. The Depression, Anxiety and Stress Scale (DASS), a 21-item self-report instrument was used to measure three related states of psychological distress: depression, anxiety and stress (see Appendix J). Items are rated on a 4-point scale (0 = never, 1 = sometimes, 2 = often, 3 = almost always). The measure has been found to be a valid and reliable measure of the three states as well as a more general dimension of psychological distress: depression $\alpha = .88$, anxiety $\alpha = .82$, stress $\alpha = .90$, total distress scale $\alpha = .93$ (Henry & Crawford, 2005).

Measure of Resilience. The Brief Resilience Scale (BRS) is a 6 item self-report measure which was designed for and used in the current study as a measure of the ability to bounce back or recover from stress (Smith et al., 2008) (see Appendix K). The measure has been shown to possess high levels of reliability and validity ($\alpha = .86$) (Smith, Tooley, Christopher & Kay, 2010; Smith et al., 2013). Items are rated on a 5-point scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). The total scale score is the mean of the responses to these items with higher total mean scores representing greater resilience.

Additional Measure of Distress. The 10-item Life Events Scale (LES) developed by Mooy, Bouter, Vries, Heine and Grootenhuys (2000) considers five key aspects of life stress:

relationship problems, financial difficulties, illness, bereavement and job difficulties (see Appendix L). Items require the frequency of each life event over the preceding five years to be provided. Total scores are represented by the sum of all frequency values. This measure was included to provide data on the more general role of stressful life events.

Procedure

Participants accessed the study by one of three pathways. Pathway one: Following seeing online advertisements for the study, participants accessed the online survey (hosted by Qualtrics) via a link on the advertisement. Pathways two and three: Participants became aware of the study through advertisements within the UCAN centre which provided them with a web link to the online survey (pathway two) or signposted them to the researcher within the UCAN centre. Upon meeting with the researcher, participants were offered access to the online study at a computer within the centre (pathway two) or alternatively received paper-based copies of the study (pathway three). The three pathways combined provided opportunities to recruit participants from varied socio-economic backgrounds. The method of data collection was recorded, for consideration within the data analysis as a possible confounding variable.

Upon accessing the study (either online or paper copy), prior to commencing the questionnaires, participants were required to read the information sheet and to provide written informed consent for participation in the study. Participants were then asked to complete demographic information followed by four questionnaires in the following order: DASS, BRS, DEBQ and LES. On average the study took approximately 11 and a half minutes to undertake. Upon completion of the survey a debrief was provided which included contact details for the researcher, should they require any further information regarding the study. National helpline contact details and a statement of advice for participants to seek medical support should they be experiencing any psychological distress were also provided. As

compensation for the time provided by participants, each participant was offered the option to be entered into a prize draw.

Statistical Analysis

According to guidance on sample size for mediation analyses (Fritz & Mackinnon, 2007), a minimum of 71 participants would be needed to detect the hypothesised associations between the key variables (80% power with medium effect sizes). On this basis, the recruited sample size ($N = 150$) indicated that the study was well-powered.

The data was analysed using the Statistical Package for Social Science (SPSS) version 20. Data were checked for outliers and tests were run to ensure assumptions for further analysis were met. Data sets of four participants had missing data for a single item, within either the DEBQ or DASS. Missing data points were handled using valid mean substitution (VMS). VMS uses the average of participants' other responses to generate a value for the missing data. It has been shown to be a valid method, when the measure in question employs multiple items to gauge a single construct and where participants have answered all remaining questions related to that construct (Dodeen, 2003). The DASS provides sub-scores for depression, anxiety and stress whilst also providing a total score combining all three aspects of psychological distress. The current study was concerned with general psychological distress. Initial correlations indicated a high level of association across the three sub-scores, therefore, the DASS overall score was utilised. A composite score was generated for SES by combining scores for the two comparably ranked scales; level of income and level of education, which have been used as reliable predictors of calculating SES (Clark et al., 2007).

Pearson's correlation coefficients were computed between the main variables of interest. Due to the variation in measurement scales used, all variables were log transformed to standardise the data prior to running further analyses. Hypothesised indirect effects (as

depicted in Figure 1) were analysed using PROCESS (Hayes, 2012). Analysis of indirect effects was conducted using bias-corrected bootstrapping within PROCESS. This compares the direct effect (independent variable [IV] – dependent variable [DV], controlling for a single mediator or for the serial effect of two mediators) with the total effect of the IV on the DV, including the indirect pathway, and produces bias-corrected confidence intervals for indirect effects via the mediator. A significant indirect effect is indicated by upper and lower confidence intervals that do not include zero. Firstly, a serial multiple mediation analysis was conducted; the independent variable (IV) was SES, the dependent variable (DV) was BMI, and the mediators were psychological distress (M1) and emotional eating (M2) (pathway i in Figure 1). Additional analysis was also run as above with three serial mediators, life events (M1), psychological distress (M2) and emotional eating (M3) (see Appendix M). Secondly, in order to test for the protective role of resilience, a moderated mediation analysis was run; the IV was SES, the DV was emotional eating, the mediator was psychological distress (M1) and the moderator was resilience (W). Both analyses were run with the inclusion of covariate variables of age and gender.

Results

Descriptive characteristics of the study participants are shown Table 1 ($N = 150$). The majority of the sample were female (83%) and white (93%). With regard to SES, 52% of the sample were employed full time, 16% were employed part time, 16% were students and 9% were unemployed and/or looking for work. The mean BMI of the sample was 26.3 (kg/m^2) (scores >25 indicative of being overweight, average UK BMI: men = 27, women = 26.9). Descriptive information concerning participants' scores on each of the measures is shown in Table 1.

Table 1

Sample Descriptives and Measures Scores (N = 150)

	Mean	Standard deviation	Range
Age in years	35.35	10.90	18 - 65
BMI kg/m ²	26.31	6.00	16.3 - 45.2
DASS	15.06	11.42	0 - 56
LES	6.14	6.39	0 - 38
Mean DEBQ	2.58	1.02	1 - 5
Mean resilience	3.25	0.80	1 - 5
Highest education level ^a	5.15	1.87	1 - 8
Yearly household income ^b	5.67	2.46	1 - 9

Note. BMI = Body Mass Index, DASS = Depression Anxiety Stress Scale, LES = Life Events Scale, DEBQ = Dutch Eating Behaviour Questionnaire.

^a 8-point scale: 1 none, 2 GCSE grade D or below, 3 GCSE grade C or above, 4 A-level or equivalent, 5 university degree or equivalent, 6 postgraduate qualification or equivalent, 7 Masters or equivalent, 8 PHD or equivalent.

^b 9 -point scale: 1 = < £5,200, 2 = £5,200 - £10,399, 3 = 10,400 - £15,599, 4 = £15,600 - £20,799, 5 = £20,800 - £25,999, 6 = £26,000 - £36,399, 7 = £36,400 - £51,999, 8 = £52,000 - £77,999, 9 = >£78,000.

The correlations between key variables are shown in Table 2. Contrary to predictions, lower SES was not significantly correlated with higher BMI. SES, as expected, was significantly negatively associated with psychological distress. Further contrary to predictions, SES was found to be significantly positively associated with emotional eating. Psychological distress was significantly positively correlated with emotional eating, and emotional eating was significantly positively correlated with BMI. Resilience correlated significantly and negatively with psychological distress but was not found to be significantly correlated with any other variable.

Table 2

Correlation Matrix to Show Pearson's Correlation Coefficients (r) Between Questionnaire Measures, SES Factors and BMI.

	1	2	3	4	5	6
1. SES	-					
2. Psychological Distress	-0.34**	-				
3. Emotional eating	0.18*	0.26**	-			
4. Resilience	0.14	-0.49**	-0.13	-		
5. BMI	-0.06	0.04	0.33**	0.05	-	
6. LES	-0.16	0.21*	0.07	0.20	-0.16*	-

Note. * $p < .05$ ** $p < .01$. SES = socio-economic status composite score, BMI = body mass index, LES = life events scale.

Effect of SES on BMI via Psychological Distress and Emotional Eating (Figure 2)

The serial multiple mediation model did not indicate a significant total effect of SES on BMI, $b(SE)$ $-.01 (.06)$, $p = .79$. With regards to the indirect pathways, as predicted, there was a significant indirect effect of SES on BMI via psychological distress and emotional eating. Lower SES predicted higher distress which, in turn, predicted higher emotional eating which, in turn, predicted higher BMI (i.e., pathway i. In Fig 1); $b(SE) = -.02 (.01)$, 95% CI = $[-.04, -.00]$. There was also a significant simple indirect effect of SES on BMI via emotional eating; $b(SE) = .06 (.02)$, 95% CI = $[.03, .10]$. Contrary to predictions this pathway indicated that higher SES predicted higher emotional eating. These two opposing pathways create a suppression effect within the total effect of the model (Krause et al., 2010). The simple indirect pathway from SES to BMI via psychological distress only, was not found to be significant $b(SE) = .01 (.01)$, 95% CI = $[-.01, .04]$. The direct effect of SES on BMI after controlling for the indirect effects (psychological distress and emotional eating) resulted in a beta change of .05 and was non-significant, $b(SE) = -.06 (.04)$, $p = .10$. Additional analysis

with the inclusion of a third serial mediator (LES) prior to psychological distress found no significant mediating pathway through LES (see Appendix M).

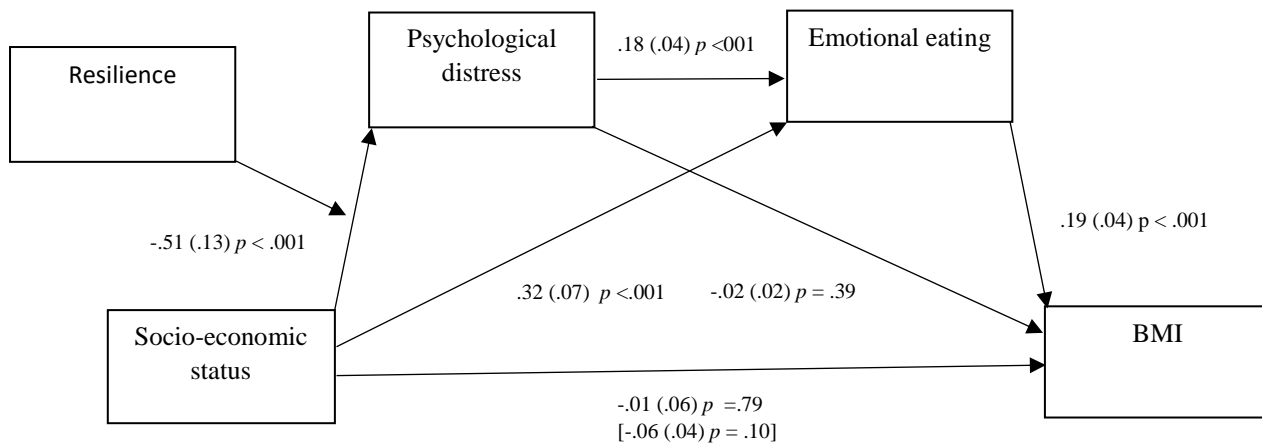


Figure 2. Serial multiple mediation analysis with socio-economic status as the independent variable (IV), BMI as the dependent variable (DV), and psychological distress and emotional eating as the first and second mediators, respectively. Values are unstandardized regression coefficients (SEs in parentheses) and associated p-values. Bracketed association = direct effect (controlling for indirect effects).

Resilience as a Moderator of the Indirect Effect of SES on Emotional Eating via Psychological Distress (Figure 2)

To examine whether resilience moderated the indirect effect between lower SES and higher psychological distress, a moderated mediation analysis was conducted to investigate the indirect effect of SES on emotional eating via psychological distress at three different levels of the moderator (resilience scores; $-1\ SD$, mean, $+1\ SD$). SES was found to be a significant predictor of psychological distress $b(SE) -.53 (.14)$, $p < .01$. Similarly, resilience was found to be an independent predictor of psychological distress, whereby higher resilience was associated with lower psychological distress, $b(SE) -1.21 (.20)$, $p < .01$. However, the significant indirect effect of SES on emotional eating via psychological distress was evident

at all three levels of the moderator (resilience) indicating that the interaction was not significant (see Table 3). The total index of moderated mediation indicated that no significant moderation was occurring $I(SE) = -.1218 (.18)$, 95% CI $[-.51, .19]$.

Table 3

Moderated Mediation of Indirect Effects of SES on Emotional Eating via Psychological Distress

	Effect (SE)	95% CI
Low resilience	-.08 (.04)	[-.18, -.03]
Medium resilience	-.10 (.04)	[-.19, -.04]
High resilience	-.11 (.04)	[-.22, -.04]

Note. Resilience scores; Low = -1 *SD*, Medium = mean, High = +1 *SD*.

Discussion

The findings of this study indicate that, as predicted, there was an indirect effect of SES on BMI via psychological distress and emotional eating; namely lower SES was predictive of higher psychological distress, higher psychological distress predicted higher emotional eating which, in turn, predicted higher BMI (pathways i, Figure 1). However, contrary to predictions, *higher* SES was also found to be predictive of *higher* emotional eating, in the simple indirect pathway independent of psychological distress. A suppression effect occurs when a significant indirect effect is cancelled out by a competing effect that has the opposite sign of the relationship which is of interest (Krause et al., 2010). This may, therefore, explain why the total effect of SES on BMI was not significant in the overall model. Higher resilience was found to be an independent predictor of lower psychological distress; however, contrary to prediction, it was not found to significantly moderate the relationship between SES and psychological distress.

The results support components of the theoretical model of obesity proposed by Hemmingsson (2014). Lower SES significantly predicted higher psychological distress which, in turn, predicted higher levels of emotional eating and higher BMI. Similarly, a recent study found that whilst lower SES was significantly associated with greater weight gain over a nine-year period, this was not mediated through a measure of psychosocial stress (perceived stress) (Ball, Schoenaker & Mishra, 2017). These results mirror the findings of the current study in that psychological distress in of itself was not found to significantly mediate the relationship between SES and BMI; the pathway required the addition of emotional eating as a coping strategy for distress, as predicted by the model of obesity proposed by Hemmingsson (2014).

SES was not significantly associated with adverse life events (LES). This suggests that it is not an increased likelihood of negative life events per se which increases the vulnerability of individuals from lower SES to experience greater psychological distress. It is possible that individuals with lower SES have more limited access to resources (i.e. material, interpersonal and intrapersonal) and that it is this, rather than events themselves, which makes them more vulnerable to experiencing psychological distress and subsequent maladaptive coping mechanisms (Lazarino, Hamer, Stamatakis & Steptoe, 2012; Matthews & Gallo, 2011). It may be that other psychological experiences, for example, feeling lower in social rank or feeling deprived underpin some of the vulnerability posed by being lower in SES, such factors are an area worthy of future exploration. The role of emotional eating is highlighted by the current study as a strategy in response to distress. This is supported by previous research which has indicated emotional eating to be significantly associated with emotion-oriented and avoidant-distraction coping (Spoon, Bekker, Strien & Heck, 2006). Furthermore, food consumption is greater in higher body weight individuals at times of

induced negative emotional states compared to a control condition (Geliebter & Aversa, 2003).

Unexpectedly, higher SES was found to be predictive of higher levels of emotional eating and, in turn, higher BMI. This finding suggests that for those in higher social-economic positions, emotional eating is also prevalent however this is not in response to significant psychological distress. Laitinen et al. (2002) found expected trends between low occupational education, long-term unemployment and stress-related eating in men. Interestingly, similarly to the current study they also found that men with degree qualifications (indicating higher SES) had significantly higher stress related eating. They hypothesise that wider social factors such as periods of economic change reduced skilled job opportunities etc, which impacted individuals of higher educational attainment and higher SES for the first time. It is possible that eating to manage emotions has become a socially acceptable day to day coping strategy for individuals of higher SES. The current study measured emotional eating via the DEBQ, which is the tendency to eat in response to a variety of emotions, some of which imply coping (e.g. in response to low mood) but others which do not (e.g., boredom). It is possible that those of higher SES may be eating in response to other emotions, not directly related to coping with distress. Future research may benefit from the use of a more targeted measure such as the eating to cope scale from the Palatable Eating Motives Scale (Burgess, Turan, Lokken, Morse & Boggiano, 2014).

A study by Pampel et al. (2012) examined economic circumstances and population weight in 67 countries and found that whilst in more economically developed nations lower SES was associated with higher BMI and obesity, in less developed countries the inverse was evident with higher SES associated with higher BMI and obesity. Houle (2013) postulates that in less economically developed countries, individuals may respond to higher SES by undertaking less labour intensive tasks and by consuming higher calorie food.

Alternatively, in more economically developed nations higher SES may allow individuals the ability to undertake regular recreational exercise and make healthy eating choices (Houle, 2013). Therefore, it may be necessary for future research to explore the generalisability of the current study's findings to other countries (of differing stages of economic development) and cultures. It is also possible that the variables of SES and psychological distress are linked to other forms of maladaptive eating such as food restriction. The complexity of human responses may mean that dependent upon contextual factors, the same person may even adopt different maladaptive eating strategies of both restrictive and over-eating. There is some evidence to support this in research related to children, where a correlation between emotional over-eating and under-eating has been shown to be evident (Wardle, Guthrie, Sanderson & Rapport, 2001). Consideration of the possible multifaceted relationships between these variables is an interesting area of future exploration.

The current study found, that higher levels of resilience were associated with lower psychological distress, which supports existing research (Fredrickson et al., 2003; Sharpley, Bitsika, Jesulola, Fitzpatrick & Agnew, 2016) but resilience did not moderate the link between SES and psychological distress. Having high resilience may not be sufficient to protect against the detrimental impact of low SES on psychological distress. Hemmingsson's (2014) original theoretical model whilst highlighting the potential protective role of resilience also emphasises a process whereby multiple protective factors create a cumulative effect (i.e. self-esteem) to reduce the risk of obesity as a result of lower SES. It is possible therefore that resilience alone in the current study, without other additional protective mechanisms, is not sufficient to moderate the relationship between SES and psychological distress.

In addition, it is important to consider more generally the construct of resilience. The Brief Resilience Scale was utilised, with higher scores indicative of greater levels of resilience, which is framed positively as an ability to “bounce back”. However, the question of whether it is really healthy and a sign of good adjustment to have such little difficulty adjusting to stressful events could be questionable. It has been argued that resilience and attachment theory are in many senses complimentary and should be viewed in tandem (Atwool, 2006). Attachment theory considers the relationship between an infant and its care giver, which creates a framework for managing emotions and exploration of the world (Ainsworth & Bowlby, 1991). Four attachment styles have been identified, with secure attachment being seen as the most well-adjusted (Ainsworth, 1979; Main, Kaplan, & Cassidy, 1985). It could be argued that midpoint scores on a measure such as the Brief Resilience Scale may be more reflective of a secure attachment where a person is affected by significant emotional difficulty but able to work through it. It may be important to consider such complimentary constructs, either alongside or instead of resilience, which may provide a more accurate perception of a person’s ability to manage adversity in a healthy way.

The current study controlled for gender and the inclusion of this control variable did not appear to markedly impact the results. However, the sample size within the current study consisted of only 18% males. Any significant differences in psychological distress and eating behaviours may have remained undetectable due to the low number of male participants. Gender has been shown to be one of the strongest socio-demographic factors that predict lifestyle behaviours (Ford et al, 2008). Previous studies in this area have found significant gender differences; in particular that the propensity to use increased consumption of food as a coping strategy may be more prevalent in women and more impacted by psychological distress and socio-economic factors than for men (Averett & Smith, 2014; Reagan & Hersch, 2005; Troop, 2016; Laitinen et al., 2002; Schmidt, 2012). However, some studies have

indicated that males may be more affected by these factors (Laitinen et al., 2002). Whilst not identified in the current study, gender appears to be an important demographic factor in understanding the use of eating behaviours in response to distress and therefore is an area for future investigation.

Clinical Implications

Obesity levels are of particular current concern and developing effective interventions are at the forefront of health agendas (Public Health England, 2017). The study highlights the important role of psychological and emotional factors in eating habits and body weight for those of lower SES. The findings indicate that current weight management initiatives should include psychological factors alongside other strategies such as the promotion of healthy eating messages, attempts to increase the availability of healthy food choices and increasing the availability exercise provision (e.g. exercise on prescription),. Initiatives and interventions to target the psychological distress associated with lower SES and in turn to develop alternative positive coping strategies to emotional eating (e.g. problem-solving, positive help-seeking, relaxation techniques etc.) may be an effective intervention and an area for consideration within both weight management services and public health initiatives. Recent local authority guidance in the UK has recommended a tailored approach by local public health authorities to meet the needs of the local population, due to the impact of wider socio-economic and community factors on obesity prevalence (Local Authority Association, 2013). The current study is consistent with this message in that targeting factors related to local deprivation may be a helpful long-term strategy to tackle the “obesity epidemic”.

Strengths and Limitations

A strength of the current study is the use of online recruitment, which provides access to a potentially large and diverse population pool. The reliability and validity of questionnaires completed online vs face to face questionnaires have been shown to be

comparable (Hewson & Charlton, 2005). The current study utilised a combination of online recruitment and promotion through Urban Community and Neighbourhood Centres (UCAN's). This strategy allowed the study to recruit participants from varied SES backgrounds. Research has indicated that individuals of lower SES are less likely to have internet access (Dutton, Blank and Groseli, 2013). Therefore, a further strength of the current study was the utilisation of the UCANs to provide both online access to the study and paper-based alternatives. The ability of participants to access paper-based copies within the UCAN centre reduced the likely sampling bias which often prevents individuals from lower SES backgrounds from partaking in research. Hewson (2014) found that generally, online samples consisted of participants from white, young, well-educated backgrounds who were proficient in the use of technology.

Whilst the current study utilised a second recruitment method via UCAN centres, this provides only one secondary recruitment pool, from one specific geographical area which has been labelled as economically deprived. It is possible that whilst the combined recruitment methods have allowed for variation in SES to be obtained, it is not fully representative of the spectrum of diversity in regards to SES and other factors such as ethnicity and gender. For example, males within the current study made up only 18% of the total participants and the majority of participants described their ethnicity as white British. An obvious limitation is the inability to meaningfully analyse and interpret the effects of such variables or lack thereof, as the sample size will be too small to detect any statistically significant differences.

The study aimed to test some of the theoretical predictions within Hemmingsson's model of obesity (2014). This is a causal model with cyclic relationships, however, the cross-sectional design of the current study enables only statistically significant correlations between variables to be ascertained rather than causal relationships.

Future Research

The current study indicates that psycho-emotional factors play an important role in explaining the association between lower SES and higher body weight, namely negative eating to cope with emotional distress. Research within weight management settings into the effectiveness of psychological interventions which aims to increase positive coping strategies may provide helpful and additional insight.

Further research is required in order to consider Hemmingsson's model its entirety. However, consideration of such complex and longitudinal considerations are challenging. A longitudinal birth cohort study could provide important insight into the full pathways proposed within the model. Further research, similar in methodology to the current study, which aims to incorporate multiple measures of additional protective factors such as resilience, self-esteem and attachment orientation may be helpful to test the cumulative power of protective factors previously described. Developing this insight could be key in order to develop more specific initiatives to increase the hardiness of both individuals and communities to the impact of lower SES. Within such a study, a focus on recruitment of male participants may also be helpful to more adequately address whether gender differences are present. Investigation of ethnic and cultural difference may also be of benefit to the existing literature.

Dissemination

The current study will be submitted to the British Journal of Health Psychology for publication. A poster presentation of the studies key findings has been presented at the European Congress on Obesity (2017) (See Appendix N), alongside a press release (See Appendix O). Liaison with the UCAN centre is ongoing to disseminate key findings.

Conclusion

This study demonstrates that the relationship between lower SES and higher BMI is partly explained by psychological distress and emotional eating to cope in line with the theoretical model of Hemmingsson (2014). These findings suggest that psychological interventions may play an important role in public health and weight management strategies. The findings from this study provide less support for a protective role of resilience in the pathway between lower SES and psychological distress. Resilience was associated with lower psychological distress, but it was not found to protect against higher distress due to lower SES. The work highlights the need for further research on which psychological factors and at what level, act as protective buffers for individuals with lower SES to further inform the type of psycho-emotional interventions required.

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Appendices

Appendix A – QATSDD criteria and scoring

Appendix B – Study advertisement

Appendix C – Ethical approval letter

Appendix D – Participant information sheet

Appendix E – Participant consent form

Appendix F – Participant debrief information sheet

Appendix G – Demographic information request sheet

Appendix H – Measure of socio-economic status

Appendix I – Dutch Eating Behaviour Questionnaire (DEBQ)

Appendix J – Depression Anxiety Stress Scale (DASS)

Appendix K – Brief Resilience Scale (BRS)

Appendix L – Life Events Scale (LES)

Appendix M – Additional data analysis with the addition of LES as a mediator variable

Appendix N – Poster presentation (European Congress on Obesity, 2017)

Appendix O – Press release (European Congress on Obesity, 2017)

QATSDD, criteria and scoring (Sirriyeh et al. 2012).

Criteria	0 = Not at all	1 = Very slightly	2 = Moderately	3 = Complete
Explicit theoretical framework	No mention at all.	Reference to broad theoretical basis.	Reference to a specific theoretical basis.	Explicit statement of theoretical framework and/or constructs applied to the research.
Statement of aims/objectives in main body of report	No mention at all.	General reference to aim/objective at some point in the report including abstract.	Reference to broad aims/objectives in main body of report.	Explicit statement of aims/objectives in main body of report.
Clear description of research setting	No mention at all.	General description of research area and background, e.g. 'in primary care'.	General description of research problem in the target population, e.g. 'among GPs in primary care'.	Specific description of the research problem and target population in the context of the study, e.g. nurses and doctors from GP practices in the east midlands.
Evidence of sample size considered in terms of analysis	No mention at all.	Basic explanation for choice of sample size. Evidence that size of the sample has been considered in study design.	Evidence of consideration of sample size in terms of saturation/information redundancy or to fit generic analytical requirements.	Explicit statement of data being gathered until information redundancy/saturation was reached or to fit exact calculations for analytical requirements.
Representative sample of target group of a reasonable size	No statement of target group.	Sample is limited but represents some of the target group or representative but very small.	Sample is somewhat diverse but not entirely representative, e.g. inclusive of all age groups, experience but only one workplace. Requires discussion of target population to determine what sample is required to be representative.	Sample includes individuals to represent a cross section of the target population, considering factors such as experience, age and workplace.
Description of procedure for data collection	No mention at all.	Very basic and brief outline of data collection procedure, e.g. 'using a questionnaire distributed to staff'.	States each stage of data collection procedure but with limited detail, or states some stages in details but omits others.	Detailed description of each stage of the data collection procedure, including when, where and how data were gathered.
Rationale for choice of data collection tool(s)	No mention at all.	Very limited explanation for choice of data collection tool(s).	Basic explanation of rationale for choice of data collection tool(s), e.g. based on use in a prior similar study.	Detailed explanation of rationale for choice of data collection tool(s), e.g. relevance to the study aims and assessments of tool quality either statistically, e.g. for reliability & validity, or relevant qualitative assessment.
Detailed recruitment data	No mention at all.	Minimal recruitment data, e.g. no. of questionnaire sent and no. returned.	Some recruitment information but not complete account of the recruitment process, e.g. recruitment figures but no information on strategy used.	Complete data regarding no. approached, no. recruited, attrition data where relevant, method of recruitment.
Statistical assessment of reliability and validity of measurement tool(s) (Quantitative only)	No mention at all.	Reliability and validity of measurement tool(s) discussed, but not statistically assessed.	Some attempt to assess reliability and validity of measurement tool(s) but insufficient, e.g. attempt to establish test-retest reliability is unsuccessful but no action is taken.	Suitable and thorough statistical assessment of reliability and validity of measurement tool(s) with reference to the quality of evidence as a result of the measures used.
Fit between stated research question and method of data collection (Quantitative)	No research question stated.	Method of data collection can only address some aspects of the research question.	Method of data collection can address the research question but there is a more suitable alternative that could have been used or used in addition.	Method of data collection selected is the most suitable approach to attempt answer the research question
Fit between stated research question and format and content of data collection tool e.g. interview schedule (Qualitative)	No research question stated.	Structure and/or content only suitable to address the research question in some aspects or superficially.	Structure & content allows for data to be gathered broadly addressing the stated research question(s) but could benefit from greater detail.	Structure & content allows for detailed data to be gathered around all relevant issues required to address the stated research question(s).
Fit between research question and method of analysis	No mention at all.	Method of analysis can only address the research question basically or broadly.	Method of analysis can address the research question but there is a more suitable alternative that could have been used or used in addition to offer greater detail.	Method of analysis selected is the most suitable approach to attempt answer the research question in detail, e.g. for qualitative IPA preferable for experiences vs. content analysis to elicit frequency of occurrence of events, etc.
Good justification for analytical method selected	No mention at all.	Basic explanation for choice of analytical method	Fairly detailed explanation of choice of analytical method.	Detailed explanation for choice of analytical method based on nature of research question(s).
Assessment of reliability of analytical process (Qualitative only)	No mention at all.	More than one researcher involved in the analytical process but no further reliability assessment.	Limited attempt to assess reliability, e.g. reliance on one method.	Use of a range of methods to assess reliability, e.g. triangulation, multiple researchers, varying research backgrounds.
Evidence of user involvement in design	No mention at all.	Use of pilot study but no involvement in planning stages of study design.	Pilot study with feedback from users informing changes to the design.	Explicit consultation with steering group or statement or formal consultation with users in planning of study design.
Strengths and limitations critically discussed	No mention at all.	Very limited mention of strengths and limitations with omissions of many key issues.	Discussion of some of the key strengths and weaknesses of the study but not complete.	Discussion of strengths and limitations of all aspects of study including design, measures, procedure, sample & analysis.



Volunteers required for psychology study

Study title: The effect of life circumstances on health and eating habits.

We are seeking volunteers aged 18-65 to take part in a psychology study which is investigating the association between life circumstances and health.

The study will take approximately 20 minutes to complete. You will be asked to complete a series of questionnaires about your health, wellbeing, personality and life circumstances

Unfortunately we are not able to include non-English speakers.

In acknowledgement of participants' contribution and time there will be the opportunity to be entered into a prize draw.

If you have any questions regarding the study, please contact jade.stewart@liverpool.ac.uk.

You may access the online questionnaire here:

https://livpsych.az1.qualtrics.com/SE/?SID=SV_6YiJCuKeFAKMwEI

If you would prefer to complete a paper-based version of the questionnaire please contact jade.stewart@liverpool.ac.uk.



Volunteers required for psychology study

Study title: The effect of life circumstances on health and eating habits.

We are seeking volunteers aged 18-65 to take part in a psychology study which is investigating the association between life circumstances and health.

The study will take approximately 20 minutes. You will be asked to complete a series of questionnaires either online, or in person at Brightmet UCAN centre. The questionnaires will ask about your health, wellbeing, personality and life circumstances

Unfortunately we are not able to include non english speakers.

In acknowledgement of participants' contribution and time there will be the opportunity to be entered into a prize draw.

If you have any questions regarding the study, please contact jade.stewart@liverpool.ac.uk.

You may access the online questionnaire here:

https://livpsych.az1.qualtrics.com/SE/?SID=SV_6YiJCuKeFAKMwEI

If you would prefer to complete a paper-based version of the questionnaire please contact jade.stewart@liverpool.ac.uk or talk to a Brightmet UCAN staff member.

From: IPHS Ethics

Sent: 04 February 2016 09:44

To: Hardman, Charlotte [cah]

Subject: IPHS-1516-LB-174-Socio-economic disadvantage as a cause of maladaptive eating?: The moderating role of resilience. (Lay title: The effect of life circumstances on health and eating habits)

Dear Charlotte

I am pleased to inform you that IPHS Research Ethics Committee has approved your application for ethical approval. Details and conditions of the approval can be found below.

Ref: IPHS-1516-LB-174

PI / Supervisor: Charlotte Hardman

Title: Socio-economic disadvantage as a cause of maladaptive eating?: The moderating role of resilience. (Lay title: The effect of life circumstances on health and eating habits)

First Reviewer: Dimitris Tsivilis

Second Reviewer: Stuart Oultram

Date of Approval: 4th February 2016

The application was APPROVED subject to the following conditions:

Conditions

- 1 All serious adverse events must be reported to the Sub-Committee within 24 hours of their occurrence, via the Research Governance Officer (ethics@liv.ac.uk).
- 2 This approval applies for the duration of the research. If it is proposed to extend the duration of the study as specified in the application form, IPHS REC should be notified as follows. If it is proposed to make an amendment to the research, you should notify IPHS REC by following the Notice of Amendment procedure outlined at <http://www.liv.ac.uk/researchethics/amendment%20procedure%209-08.doc>.
- 3 If the named PI / Supervisor leaves the employment of the University during the course of this approval, the approval will lapse. Therefore please contact the Institute's Research Ethics Office at iphsrec@liverpool.ac.uk in order to notify them of a change in PI / Supervisor.

Best Wishes

Liz Brignal

Secretary, IPHS Research Ethics Committee

Email: iphsrec@liv.ac.uk



Information sheet

Research Title: The effect of life circumstances on health and eating habits.

You are being invited to participate in a research study.

My name is Jade Stewart. I am a trainee Clinical Psychologist and I am conducting this research as part of a Doctorate in Clinical Psychology at the University of Liverpool. I am being supervised by Dr Charlotte Hardman.

Before you decide whether to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and feel free to contact me if you would like more information or if there is anything that you do not understand. I would like to stress that you do not have to accept this invitation and should only agree to take part if you want to.

Thank you for reading this.

What is the research about?

This research is looking at the relationship between life circumstances, personality, health and eating behaviours.

What happens if you choose to take part?

It is important that you understand that taking part is voluntary. You are free to stop and withdraw at anytime without explaining why.

The study should take approximately 20 minutes to complete.

If you would like to take part you will be asked to complete a number of questionnaires either online or via paper.

Will my answers be kept confidential?

All data which is collected will be anonymised. This means that your data does not include any of your personal details that could identify you. It is not possible for anybody including the researcher to link you to your answers. The data will be stored securely and used only for the study outlined above. It will be kept for 5 years and then destroyed of in a confidential manner.

Expenses and / or payments

In acknowledgement of your contribution and time there will be the opportunity for you to be entered into a prize draw for an electronic tablet or a £20 shopping voucher.

25/1/2016 Version 1

If you wish to enter the prize draw you will need to provide a way to contact you if you win such as an email address or postal address. This will be stored separately from the other information you provide and will be destroyed immediately after the prize draw has been completed.

Is there any risk to me taking part?

We do not expect there to be any risks to you if you take part in the study. In the unlikely event that you do experience any discomfort or disadvantage during the study, please contact me immediately.

What will happen to the results of the study?

We intend to publish the results from this study in a scientific journal. No personal information will be disclosed to anyone and you will not be identified in any publication.

If you are interested in the results of the study, please let me know and we can make a summary of the research available to you when it has been completed.

What will happen if I want to stop taking part?

You are under no obligation to take part in this study; it is completely your choice. If you do decide to take part, you are free to withdraw at any time and without explaining why. If you have not completed the study the answers you have provided up until that point will not be used.

What to do if you are unhappy

If you are unhappy, or if there is a problem, please feel free to contact me, (jade.stewart@liverpool.ac.uk, 0151 794 5530 and I will try to help. If you remain unhappy or have a complaint which you feel you cannot come to me with then you should contact the Research Governance Officer at ethics@liv.ac.uk. When contacting the Research Governance Officer, please provide details of the name or description of the study (so that it can be identified), the researcher(s) involved, and the details of the complaint you wish to make.



PARTICIPANT CONSENT FORM

Title of Research Project: The effect of life circumstances on health and eating habits.

Researcher(s): Jade Stewart
supervised by Dr Charlotte Hardman

**Please
initial box**

1. I confirm that I have read and have understood the information sheet dated 25/1/2016 for the above study.
2. I understand that in order to take part in the study, I should be 18 to 65 years old and English speaking.
3. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without my rights being affected.
4. I understand that my responses will be kept strictly confidential. I give permission for members of the research and review team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identifiable in reports that result from the research.
5. I agree to take part in the above study

Participant Name

Date

Signature

Researcher

Date

Signature

Principal Investigator:

Name: Dr Charlotte Hardman
Address: University of Liverpool, Eleanor Rathbone Building,
Bedford Street South, Liverpool, L69 7ZA
Work Telephone: 0151 7941480
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Student Researcher:

Name: Jade Stewart
Work Address: Doctorate in Clinical Psychology
Ground Floor, Whelan building, University of
Liverpool, Brownlow Hill, Liverpool, L69 3GB.
Work Telephone: 0151 7945530
Work Email: jade.stewart@liv.ac.uk



Debrief

Thank you for taking part in this study.

What was the study about?

The aim of this study is to better understand the relationship between life circumstances, personality, health and eating behaviours.

The questionnaires you have completed allow us to see what factors are most important to help us better understand these relationships.

The findings are likely to have important implications for health improvement strategies and support services.

Please feel free to ask the researcher if you have any further questions.

What if I want advice or I am worried about my health or wellbeing following the research?

We are not qualified to offer advice ourselves. We would recommend that you talk to your GP if you are worried about your health or wellbeing. The following information from these sources may also be informative:

<http://www.nhs.uk/conditions/stress-anxiety-depression/pages/low-mood-and-depression.aspx>

<http://www.nhs.uk/Tools/Pages/Healthyweightcalculator.aspx>

<http://www.b-eat.co.uk/>

Samaritans 08457 90 90 90 for confidential, non-judgmental emotional support.

Who can I contact if I have further questions about the research?

If you have any questions please contact me: Jade Stewart, Doctorate in Clinical Psychology Training Programme, Whelan Building, University of Liverpool, Liverpool, L69 3GB. Email: jade.stewart@liverpool.ac.uk Tel: 0151 7945530.

If you do not feel you can come to me you can alternatively contact my supervisor Dr Charlotte Hardman Tel: 0151 794 1480 Email: charlotte.hardman@liverpool.ac.uk. If you remain unhappy or have a complaint which you feel you cannot come to me with then you should contact the Research Governance Officer at ethics@liv.ac.uk. When contacting the Research Governance Officer, please provide details of the name or description of the study (so that it can be identified), the researcher(s) involved, and the details of the complaint you wish to make.

Demographics**What is your gender?**

- ☐ Male
- ☐ Female

What is your age?

First 3-4 characters of post code (if you are an undergraduate or postgraduate student temporarily living away from home please provide details for your home/parents postcode)

What is your ethnic group? (Choose one option that best describes your ethnic group or background)

- ☐ White
- ☐ Mixed/Multiple ethnic groups
- ☐ Asian/Asian British
- ☐ Black/African/Caribbean/Black British
- ☐ Other Ethnic group

Height

Feet/Inches

or

Meters/Centimeters

Weight

Stones/pounds

or

Kilograms

SES Measures

What is the highest level of education you have obtained

- ☐ No formal qualifications
- ☐ GCSE grade D and below or equivalent
- ☐ GCSE grade C and above or equivalent
- ☐ College qualification such as A-level or equivalent
- ☐ Undergraduate degree or equivalent
- ☐ Masters or equivalent
- ☐ PHD/Doctorate or equivalent

What is your current employment status (if more than one applies, please pick the one which best represents your circumstances)

- ☐ Employed full time (employee or self-employed)
- ☐ Employed part time (employee or self-employed)
- ☐ Unemployed looking for work
- ☐ Unemployed not looking for work
- ☐ Retired
- ☐ Student
- ☐ Unable to work due to health or disability
- ☐ Housewife/husband
- ☐ Voluntary employment

What is your household's total income from all sources over the last 12 months? (if you are an undergraduate or postgraduate student temporarily living away from home please provide details for your home/parents household)

Count income from every person in your household.

Include:

All earnings (include overtime, tips, bonuses, self-employment)

All pensions

All student grants and bursaries (but not loans)

All benefits and tax credits (such as child benefit, income support or pension credit)

All interest from savings or investments

All rent from property (after expenses)

Other income (such as maintenance or grants)

Do not deduct: Taxes, National Insurance contributions, Health Insurance Payments, Superannuation payments

- ☐ Less than £5,200 a year (less than £100 a week)
- ☐ £5,200 - £10,399 a year (£100 - £199 a week)
- ☐ £10,400 - £15,599 a year (£200 - £299 a week)
- ☐ £15,600 - £20,799 a year (£300 - £399 a week)
- ☐ £20,800 - £25,999 a year (£400 - £499 a week)
- ☐ £26,000 - £36,399 a year (£500 - £699 a week)
- ☐ £36,400 - £51,999 a year (£700 - £999 a week)
- ☐ £52,000 - £77,999 a year (£1000 - £1499 a week)
- ☐ £78,000 a year or more (£1,500 a week or more)

DEBQ

	Never	Seldom	Sometimes	Often	Very Often
11. Do you have the desire to eat when you are irritated?					
12. Do you have a desire to eat when you have nothing to do?					
13. Do you have a desire to eat when you are depressed or discouraged?					
14. Do you have a desire to eat when you are feeling lonely?					
15. Do you have a desire to eat when somebody lets you down?					
16. Do you have a desire to eat when you are cross?					
17. Do you have a desire to eat when you are expecting something unpleasant to happen?					
18. Do you get the desire to eat when you are anxious, worried or tense?					
19. Do you have a desire to eat when things are going against you or when things have gone wrong?					
20. Do you have a desire to eat when you are frightened?					
21. Do you have a desire to eat when you are disappointed?					
22. Do you have a desire to eat when you are emotionally upset?					
23. Do you have a desire to eat when you are bored or restless?					

DASS

The rating scale is as follows:

- FOR OFFICE USE

		N	S	O	AA	D	A	S
1	I found it hard to wind down	0	1	2	3			
2	I was aware of dryness of my mouth	0	1	2	3			
3	I couldn't seem to experience any positive feeling at all	0	1	2	3			
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3			
5	I found it difficult to work up the initiative to do things	0	1	2	3			
6	I tended to over-react to situations	0	1	2	3			
7	I experienced trembling (eg, in the hands)	0	1	2	3			
8	I felt that I was using a lot of nervous energy	0	1	2	3			
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3			
10	I felt that I had nothing to look forward to	0	1	2	3			
11	I found myself getting agitated	0	1	2	3			
12	I found it difficult to relax	0	1	2	3			
13	I felt down-hearted and blue	0	1	2	3			
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3			
15	I felt I was close to panic	0	1	2	3			
16	I was unable to become enthusiastic about anything	0	1	2	3			
17	I felt I wasn't worth much as a person	0	1	2	3			
18	I felt that I was rather touchy	0	1	2	3			
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3			
20	I felt scared without any good reason	0	1	2	3			
21	I felt that life was meaningless	0	1	2	3			
TOTALS								

APPENDIX K

Brief Resilience Scale (BRS)

Please respond to each item by marking <u>one box per row</u>		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
BRS 1	I tend to bounce back quickly after hard times	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
BRS 2	I have a hard time making it through stressful events.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
BRS 3	It does not take me long to recover from a stressful event.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
BRS 4	It is hard for me to snap back when something bad happens.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
BRS 5	I usually come through difficult times with little trouble.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
BRS 6	I tend to take a long time to get over set-backs in my life.	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *International journal of behavioral medicine*, 15(3), 194-200.

Life Events Scale (LES)

How many times in the past 5 years have you experienced the following:

Non-work events

Serious or long-lasting illness of a child

Death of a child

Serious or long-lasting problems with a child

Serious or long-lasting problems with a partner

Death of a partner

Death of a relative

Serious or long lasting financial problems

Moving from a house

Death of a friend

End of intense relationship

Work-related events

Retirement

Disability for work > 1year

Forced job change

Serious or longstanding work problem.

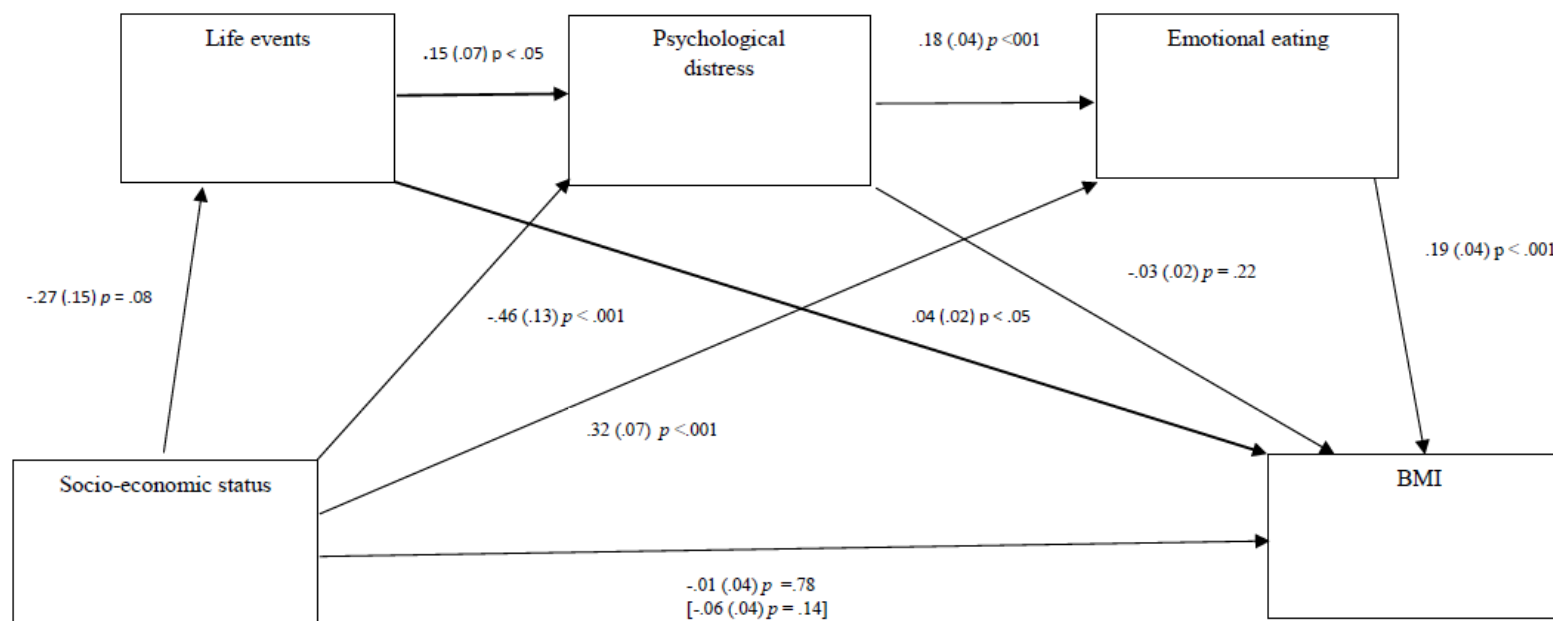


Figure. Serial multiple mediation analysis with socio-economic status as the independent variable (IV), BMI as the dependent variable (DV), and life events, psychological distress and emotional eating as the first, second and third mediators, respectively. Values are unstandardized regression coefficients (SEs in parentheses) and associated p-values. Bracketed association = direct effect (controlling for indirect effects).

The indirect pathways which incorporated life events were not found to be significant (see Table).

Table.

Mediating Pathways (Inclusive of Life Events Variable) from SES to BMI

Mediating pathway	<i>b</i>	Effect (<i>SE</i>)	95% CI
SES – Life Events - BMI	-.01	.01	[-.04, .00]
SES – Life Events – Psychological Distress - BMI	.00	.00	[-.00, .00]
SES – Life Events – Emotional Eating - BMI	-.00	.00	[-.01, .00]
SES – Life Events – Psychological Distress – Emotional Eating - BMI	-.00	.00	[-.01, .00]

Note. SES = Socio-economic Status, BMI = Body Mass Index

There was a significant indirect effect of SES on BMI via psychological distress and emotional eating. $b(SE) = -.02 (.01)$, 95% CI = [-.04, -.01]. There was also a significant simple indirect effect of SES on BMI via emotional eating; $b(SE) = .06 (.02)$, 95% CI = [.03, .10].

How does socio-economic disadvantage influence body weight?: The mediating role of psychological distress and maladaptive coping strategies

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1. Introduction

Lower socio-economic status is robustly associated with obesity¹.

The underpinning psychological mechanisms for this relationship are currently unclear. Research has focused upon practical factors such as the availability of low cost unhealthy food; however, this has not been shown to fully explain the relationship between socio-economic status and obesity².

A recently proposed theoretical model proposes that socio-economic disadvantage increases psychological distress which, in turn, promotes maladaptive coping behaviours, such as emotional eating, and ultimately obesity³.

Additionally, factors such as individual resilience are hypothesized to moderate the relationship between socio-economic disadvantage and psychological distress thus providing a protective role against obesity.

Aim

The current study tested whether psychological distress and subsequent emotional eating to cope mediated the relationship between socio-economic status and BMI, and whether this relationship was moderated by resilience.

2. Methods

Participants and design

Adults ($N = 150$), aged 18 to 65 years and from a range of socio-economic backgrounds. Cross sectional design; participants reported their income and education level as an indicator of socio-economic status. The following variables were assessed: psychological distress (Depression, Anxiety and Stress Scale), emotional eating (Dutch Eating Behaviour Questionnaire) and resilience (Brief Resilience Scale). Self-reported height and weight were also obtained to calculate body mass index (BMI).

Procedure

The study was advertised through Urban Community and Neighbourhood Centres (UCAN's) which are situated in deprived areas and via online advertisement.



Study promotional material directed participants to an online platform for completion of questionnaires. Paper based copies were also available at UCAN centres.

3. Results

As predicted, there was a significant indirect effect of lower socio-economic status on higher BMI via increased psychological distress and increased emotional eating, $b(SE) = -.02 (.01)$, 95% CI = $-.040$ to $-.006$ (Fig. 1).

Unexpectedly, higher socio economic status was significantly positively associated with higher emotional eating in the simple indirect effect (not including psychological distress) $b(SE) = .06 (.02)$, 95% CI = $.029$ to $.104$.

The total effect of socio-economic status on BMI was not significant, $b(SE) -.01 (.06)$, $p = .79$, likely due to a suppression effect.

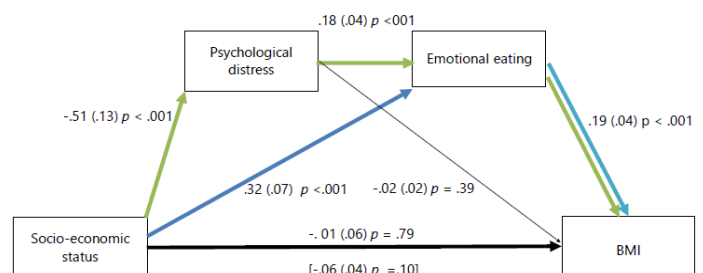


Fig 1. Serial multiple mediation analysis with Socio-economic status as the independent variable (IV), BMI as the dependent variable (DV), and psychological distress and emotional eating as the first and second mediators, respectively. Values are unstandardized regression coefficients (SEs in parentheses) and associated p-values. Bracketed association = direct effect (controlling for indirect effects).

Resilience was not found to significantly moderate the effect of socio-economic status on emotional eating via psychological distress. Total index of moderated mediation $I(SE) = -.12 (.18)$, 95% CI = $-.51$ to $.19$.

4. Conclusions

The relationship between socio-economic status and obesity, may be partly explained by psychological distress and subsequent emotional eating as a coping strategy.

Targeting these maladaptive coping behaviours in response to distress may be a way of reducing obesity in low-income populations.

The results shed light on a psychological explanation for the association between socio-economic status and BMI.

5. References

- ¹ Parsons, et al (1999). *International journal of obesity*, 23.
- ² Cobb, et al (2015). *Obesity*, 23(7), 1331-1344.
- ³ Hemmingsson, E. (2014). *Obesity Reviews*, 16, 769 -779.

Lower socioeconomic status is linked to obesity through distress and emotional eating

Embargo 0001H Porto/UK time Thursday 18 May

New research presented at this year's European Congress on Obesity in Porto, Portugal (17-20 May) shows that lower socioeconomic status is associated with higher body-mass index (BMI) through its effects on distress and subsequent emotional eating. The study is by Jade Stewart and Dr Charlotte Hardman, Department of Psychological Sciences, University of Liverpool, UK and colleagues.

Lower socioeconomic status is robustly associated with obesity; however, the underpinning psychological mechanisms remain unclear. According to a recent theoretical model*, socioeconomic disadvantage increases psychological distress which, in turn, promotes maladaptive coping behaviours, such as emotional eating, and ultimately obesity. Furthermore, resilience (an individual's capacity to cope with stressors and 'bounce back') is thought to moderate the association between socio-economic disadvantage and distress thus providing a protective role. The current study sought to test these predictions.

A total of 150 adults aged 18 to 65 years and from a range of socio-economic backgrounds, reported their income and education level as an indicator of socioeconomic status. Psychological distress, emotional eating, and resilience were assessed using the Depression, Anxiety and Stress Scale, the Dutch Eating Behaviour Questionnaire, and the Brief Resilience Scale, respectively. Self-reported height and weight were also obtained to calculate body mass index (BMI).

As predicted, the data (adjusted for age and sex) indicated a significant indirect effect of socioeconomic status on BMI via psychological distress and increased emotional eating; specifically, lower socioeconomic status was associated with higher distress, higher distress was associated with higher emotional eating, and higher emotional eating was associated with higher BMI. An increase by 1 scale point on the emotional eating scale (on a 1 to 5 scale) was associated with an increase in BMI of 1.9 kg/m². Mean BMI at the lowest point on the emotional eating scale was 23.3 kg/m². At the highest point it was 30.9 kg/m². However, contrary to prediction, resilience was not found to moderate this effect.

The authors conclude: "These findings provide a novel insight into the relationship between socioeconomic status and obesity, suggesting that it may be partly explained by psychological distress and subsequent emotional eating as a coping strategy. Targeting these maladaptive coping behaviours in response to distress may be a way of reducing obesity in low-income populations."

They add: "One way of doing this would be to teach people to implement more positive coping strategies when they are in a state of distress for example going for a walk instead of eating chocolate."

The association between low SES and access to cheap energy-dense foods and subsequent obesity is already well-documented. What this study does is to shed light on a psychological explanation for the association between SES and obesity and this has received little consideration in research to date."

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Note to editors:

Conflict of Interest Statement: Charlotte Hardman and a co-author Paul Christiansen receive research funding from the American Beverage Association.

References: *Hemmingsson, E. (2014). A new model of the role of psychological and emotional distress in promoting obesity: conceptual review with implications for treatment and prevention. *Obesity Reviews*, 16, 769 -779.

This press release is based on poster hot topic 962 at the European Congress on Obesity (ECO). All accepted abstracts have been extensively peer reviewed by the congress selection committee.

TO see the full poster: SEE LINK